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The Pipes of Peace

By MAJOR SHERMAN MILES, C. A. C.

"OH yes, we are going to do away with war"—the professor settled back in his chair as he added with a twinkle—"and that means getting rid of all you soldiers and sailors and your expensive toys."

"No more war! No more adventures 'over there'! Well," the soldier smiled reminiscently, "it was my job, and perhaps I don't look back on it with so much regret as you do. For nearly two years we had you out of your laboratories and classes, didn't we? Your legs harnessed in puttees and a foolish looking cap on your head—hard on you, that! But seriously, old man, just how much of a pacifist are you?"

The professor winced a bit in spite of himself. "Enough to make me sure that you fellows have got to get out. Your day has passed. The future belongs to producers, creators, or at least educators. Get out of the way!"

"Couldn't you be a little bit more specific about your credo," asked the soldier? "Most pacifists—"

"Look here! I don't like that word, and you know it. I am simply a practical man of science, and I happen to know as much of actual war as you do. I hate it. It is the most egregious folly. It can and will be abolished. Why man, look at the world today, the civilized world, I mean. We have cleaned up slavery, dueling, torture of prisoners, all sorts of barbarisms. Can you imagine that we will balk at this super-barbarism, this consumate stupidity which costs us hundreds of millions a year to keep penned up, and then breaks out every so often and rends us to pieces? Nonsense! You cannot stop progress."

The soldier carefully filled his pipe. "Such a flare up about that pretty word 'pacifist'! Why should you dislike it? I am thinking of adopting it myself." The pipe was now satisfactorily packed, and working well. "I am disappointed in you, *mon vieux.* When you dug into that chair I thought we might have one of our good old pow-wows, such as we had in those days when we settled the affairs of the nations after the Armistice. But your stand on peace (I avoid the word you dislike) seems rather thin as a basis for argument. You say you hate war, condemn it as the greatest folly, and believe it can and will be abolished. But so do I. I hate the realities of war, as distinguished from its glamour and its adventure. The nobility of its sacrifices does not, I agree, compensate for its utter waste and brutality. And that it can and will

be abolished I also believe. But when? There is not much use prognosticating on a too distant future. The point is, can war be abolished within the next thirty years, say, or if you like, before the next big exhibition of international folly?"

"There you are," the professor shot back. "That's just where we differ. And its just what I meant by saying that you and your kind would have to get out. You cannot see how rapidly the world moves. You cannot see that you are even now a back number on the verge of an era of peace."

"Perhaps not," the soldier admitted. "Senility is not usually recognized by its victim. But I believe you scientists generally estimate the power of a given body to overcome another by doing a little figuring on relative mass and velocity. With peace and war we are dealing more or less with imponderables, but we can look at the problem on broad lines. War has been with us—how long? It's prehistoric, probably. To be conservative, call it a going concern for sixty centuries. Quite long enough to have made a deep impression on the manner in which men think. Your peace movement, I am told, can be traced back through the last three centuries. But it was hardly recognizable as a force much before 1900. Say thirty years of headway, against six thousand. And only fourteen years ago the Great War cut through European concord like a knife. Now, what advance has world peace made since the Armistice of 1918? You have the League and you have Locarno. Add the Washington Treaties, if you like, and various arbitration and peace pacts. As against the enormous accumulation of war tradition, the inertia of war habits and psychology built up through so long a period, do you really think that world peace has gathered sufficient momentum to win through in your day or mine?"

"You are on the wrong track, soldier-man, the wrong track entirely. The force you should measure, and cannot, is will-to-peace. That is the mass in your problem. Its present velocity is relatively unimportant. What pacifism has actually accomplished, in the mechanism of international control, in the past ten years or in a century is of little consequence compared to the enormous growth in pacific education and will throughout the world. You forget that there is such a thing as potential energy, as well as kinetic. The world today is building up a potential will-to-peace, an enormous head of water impounded and ready to drown your war fires if they ever flare up again. I don't in the least agree with you that the tangible progress of pacifism in the past years has been negligible. But its intangible force is the thing with which you have to reckon. That is the sanction, the strong arm against war. Why, man, the elimination of war is front page news today all over the world. Great bodies of men and women are working for it constantly. The enormous interests of trade and transportation and business of all sorts are practically solid behind it. And so is public opinion. That is why I say your profession is now a detriment to the world. You stand in the way of progress."

The soldier smoked in silence for a moment. "That's a good deal to think about. Of course, the tangible results of pacifism are not negligible. I merely suggested that they are not yet indicative of final and immediate success. As

for your potential force, which you so aptly describe as intangible, I can only say that, since I cannot measure it, neither can you. What use, then, can we make of it to gauge the power of the peace movement as it goes up against this old war force? I dare say your potential will-to-peace may be considerable. But it may also be misleading. It seems to me that I have read of other periods in the past, after great wars—the Napoleonic, for instance—in which war-weariness might easily have been mistaken for will-to-peace, for real reform. And remember that your boy and mine will not visualize war as we do."

"You soldiers—you never think of force except in its material manifestations, do you? Yet your Napoleon said something about the superiority of moral force over material. War-weariness? Of course we have had it in the past. But never before have we been able to canalize it into actual will-to-peace, to use it educationally. We are doing that now, my friend, and doing it with a vengeance."

"Well," the soldier advised, "make the most of it and get something done, if you can, while the world is in a mood for it. And don't be too sure that America's desire for peace is the mirror of a world sentiment. So many peoples before us have gathered unto themselves the earth's bounty and longed only for peace in which to enjoy it! Perhaps in our times, as in the past, the desire for peace may turn out to be much stronger among us, a sleek and prosperous nation, than among some others. In the eyes of the leaner ones I am afraid we appear rather hypocritical. We won our independence in war. We conquered much of our territory in war. We got still more of it, and much of our prosperity, as a result of other peoples' wars. And now, satiated, we ask only for peace!"

"That is true. But it is also true that you soldiers have made of war such an abomination, even to the victors, that the security of peace has become a world movement to an extent never before even imagined. That is why fifty-five nations have joined the League, with its attendant responsibilities for war suppression. That is why regional agreements involving certain renunciations have been made at Locarno and at Washington. And all this in a decade, in less time than you soldiers have taken to fight some of your wars. What more had you expected of the nations that they might prove their faith?"

"Sacrifice, my altruistic friend, tangible sacrifice," the soldier replied. "What are the nations willing to pay for peace? Under the present system they pay yearly hundreds of millions of dollars for their armed forces. And those armed forces—the nations, in fact—presumably stand ready to make the greatest sacrifice in war to win an honorable peace. What I am looking for is some commensurate spirit of sacrifice under your new dispensation. What are you willing to give up, what are you willing to pledge for the future? Your intangible, potential will-to-peace—no, that is too ephermeral. What counts is the surrender of freedom of action, of power. And how states, as well as men, do hate to give up power! Measure the amount of self-will and power thrown into the common pool for the sake of peace and you will get a pretty accurate estimate of the advance of your new era."

"All right, you old materialist," said the professor, "I'll take you on your own ground. Let's start with the League. Perhaps you have not remarked that in that 'common pool' fifty-five nations have limited not only their sovereign right to make war but also their liberty of action should war come. For they have pledged themselves to common action in its suppression. Here is sacrifice, both in renunciation and in promissory notes on the future. Then there is Locarno. A regional agreement that, in which the bitterest enemies of the late war have pooled their interest in peace by paying in their sovereign war-rights and liens on their future freedom of action. And for full measure, since measure you will have, let's come nearer home. Have you forgotten that at Washington our own government voluntarily scrapped considerable of your naval friends' war-tonnage and agreed to stop you soldiers from building provocative forts in a critical area of the world? How do you measure that, you old war horse?"

"The League, Locarno, and Washington," the soldier repeated. "Well, let's give the new internationalism all the credit we can. But let's look it squarely in the face. This League, for instance—in one test of practical value it seems to me to have shown singular weakness. It has not sold itself, as peace insurance, to the very people who most avowedly and unmistakably want peace—our own. In spite of our share in bringing it into existence and the passionate pleas of our then President, we would have none of it. Why? Can you deny that fundamentally it was because we would not pledge ourselves to cooperative action, would not give up our freedom of decision? Leaving aside the question whether we were right or wrong, whether the League is good or bad, my point is that the most pacific of nations has constantly refused to buy League insurance at the price of freedom of action. We don't believe in it enough to pay into the common pool that which we must pay if we are to get peace by cooperation."

"That is not a fair criticism, soldier-man. In our idealism we may be the most pacific nation, but there are others who stand in even more practical need of peace. Why should our judgment on the League be the criterion? When we turned it down we were sick of European brawls and suspicious of the League as an instrument of our late allies. We had no faith in that form of cooperation against war. But does that condemn it? You asked for proof of national willingness to make sacrifices for peace. Well, in the League you have it. Fifty-five nations have gone mighty near the limit—far nearer than we have ventured—in condemning war, in discouraging it by threats of concerted action and punishment, and in pledging themselves to use all peaceful means of settlement. Until the League comes under the strain of a great crisis and is either proved or broken, how can you judge its worth? Do you think it fair to assume that, simply because we have not subscribed to them, the League will not or cannot carry out its pledges?"

"On that ground alone, no," the soldier replied. "But it seems to me by no means certain that the League members themselves have much faith in their cooperative willingness to suppress war. They have concluded that disarma-

ment is dependent on national security—which of course it is. Yet the League apparently fails to provide the necessary security, if we may judge from the fact that armaments have not been materially reduced and from the further fact that the Rhineland Pact of Locarno is avowedly a stop gap, to remain in force until such security is provided."

"But," the professor reminded him, "the French army was somewhat reduced after Locarno. So you see some measure of security may be had from international pacts. Give the League time. A decade is a short space in which to cure an immemorial evil, as you yourself said. The pledges in the League Covenant for cooperative action in suppressing war mark a long stride forward, even if they are not everywhere taken at their full value. Wait a bit, until the world gets used to a new idea. And remember that the League's resolution of September, 1927—to say nothing of the recent Pact of Paris—to refrain from all wars of aggression and to employ pacific means of settlement in every case marks an even greater advance. Also the League led to Locarno. It probably means more than five nations should have agreed at Locarno to combine against any one of them which breaks the peace in a specific area than that fifty-five should have undertaken the more general and therefore more indefinite responsibilities of Articles X and XVI of the League Covenant."

"Locarno—yes," the soldier agreed. "There we had concrete evidence of national willingness to make sacrifices for peace. There seems to be a loophole in that clause reserving from arbitration disputes 'belonging to the past'; but, taken in conjunction with the Rhineland Pact and the Guarantee Treaties, I admit there is small chance of war if the written pledges hold. I also see some significance in our own desire to make war difficult—in the Root and Bryan treaties, for instance, and in our recent treaty with France. But what is the measure of our progress? We went in first for limited arbitration—the Root treaties—and agreed to arbitrate all legal questions, specifically excepting certain categories. Then we worked along the line of conciliation in the Bryan treaties, and agreed not to go to war about anything until after an impartial investigation, to be completed within a year. Now we are renewing our treaties of limited arbitration. But—we refused to extend the application of the Root treaties in 1912; we have allowed the appointment of commissions under the conciliation treaties to lapse until today only one of those eighteen treaties is in working order; and arbitration—well, we are not a party to any one of the eighty-two unlimited arbitration treaties now in effect. In the matter of defining what we are willing to arbitrate, we seem to have advanced in about twenty years from the point at which we reserved from arbitration all questions of 'vital interest, independence or honor' to reservations of matters which we may consider domestic or involving 'the Monroe Doctrine or the Covenant of the League'. Whether in practice our progress has been real or only verbal the future alone can show. The French press questioned whether any conceivable dispute would clearly fall to arbitration under our recent treaty. However that may be, the point is that so far we have always made reservations. We have reserved certain questions even from the jurisdiction of the World Court, and as

a result we have not been admitted to membership of that body. There are certain matters, in which others might be interested, which we mean to settle for ourselves. Whether this be right or wrong there is no use blinking the fact that, in the last analysis, it means one of two things: either we get our own way or —war. Unless we ratify the Pact of Paris without reservations, our willingness to renounce war cannot yet be said to be quite whole-hearted."

"Still," insisted the professor, "we mean to narrow those reserved questions down, to limit the possible use of you soldiers. And that is progress. At Havana we induced our Latin neighbors to meet us within a year and try to reach a common minimum of non-arbitrable questions. We can then see just how far arbitration can go, just how much we can hedge in the possibilities of war. And please remember that practically our entire progress towards arbitration and conciliation has taken place within the past twenty years. If you want to measure the change in our attitude, compare the ease with which our last arbitration treaty was ratified with the bitter opposition to all foreign co-operation which killed our treaty with Britain in the Senate thirty years ago."

"Oh, I don't know about that," the soldier protested. "Why go back thirty years? Only two years ago, in the Senate resolution on the World Court, we made it very plain indeed that we mean to keep in our own hands those matters which we consider pertain to us and to our chosen policies. Up to 1926, at least, we do not seem to have made any marked swing towards internationalism."

"Ah," returned the professor, "but the World Court was set up by the League! Since we are not in the League, our attitude towards the Court is hardly a true index of our stand on international relations. You should take, instead, the Washington Treaties as a fair example of our present willingness to cooperate. I notice, by the way, that you say very little about those interesting documents. Are you perhaps a bit tender on the subject of our military renunciations at Washington?"

"No," the soldier replied. "Why should I be? It was a move in broad national politics on our part. We gained our political ends—well and good. If you conceive of the Army and Navy as instrumentalities of statecraft, which they are, there is certainly nothing to weep about when they are pared down a bit to gain political ends of the state. In war we must certainly be prepared to suffer loss in order to accomplish the political aims of our country. If we can do it in peace, so much the better."

"That's fair enough," said the professor, "although I am afraid your naval friends would not entirely agree with you as to the ends gained at Washington. It has always seemed to me that the true significance of the Washington Conference lay more in its political agreements than in the much talked of scrapping of ships. I think the Washington and Havana Conferences are indicative of a very real movement on our part to forestall possibilities of war, to reach mutual understandings betimes, and, in conjunction with the Pact of Paris, to renounce war altogether."

"Perhaps they are," the soldier admitted. "But how much is renunciation of war, *per se*, worth? Will it hold without some international machinery to

enforce peace? Our recent treaty with France purports to be an 'example' of our 'condemnation of war as an instrument of national policy'. Yet it is hedged about with limitations and provides no method of enforcement. We propose to go much further in renunciation; to forswear war without reservation and with all nations. Can we find in renunciation of war an effective means of reconciling our traditional policy of no-entanglements with our desire to cooperate internationally to secure peace? And if we can, will that method work? As I see it, the Europeans, to whom peace-or-war is a hair trigger proposition and who presumably know more about it than we do, are working along much more positive lines. They are going in for pretty strong sanctions and for arbitration without loopholes. But we Americans, while shying from the responsibilities of cooperative enforcement of peace, put our money (up to the present with certain reservations) on treaty condemnation or 'outlawry' of war. Will it do the trick, do you think?"

"Yes and no. And that is not a professorial dodging of the question, either. If we can get a goodly part of the civilized world to renounce war sincerely, to outlaw it publicly, have you ever thought of the educational lever it would give us? Raise a generation or two on the idea that war is outlawed, and where will you be, soldier-man? Lincoln issued his Emancipation Proclamation as a war measure, as a moral force against the Confederacy. And it justified itself. Now, if the idea of emancipation from slavery could permeate to an appreciable extent into the heads of the cotton-spinners of Lancaster, how much more do you think the idea of emancipation from war might affect the world today, linked together by marvelous and rapidly growing communications? And then, remember this: Like all written laws, treaties ultimately depend for their execution on public opinion. If we can get the mind of the world set on the idea that war is outlawed, we shall need no other sanction to suppress or punish it if it ever crops up. . . . The 'no' comes in on those questions reserved from arbitration. So long as the nations cannot agree in advance to arbitrate or otherwise amicably settle all questions, we cannot really say that war is outlawed. If we will not bind ourselves to arbitrate a question vital to the Monroe Doctrine, for instance, it would be absurd to say that we would not defend it by force, if necessary. For such a proposition, in any case in which an aggressor stood pat on some ground he had already gained, would be equivalent to a renunciation of the Doctrine itself. Rather than do that, we had much better agree to conciliation or arbitration. It will come to that if we really mean to renounce war. There is also a time factor involved in the effectiveness of renunciation of war. I suspect that we may need some method of enforcing peace for a while, until the world gets weaned from the idea of war. There is a large residue of hate and suspicion still about. And, as you said a while ago, one cannot yet see any great amount of peace confidence as evidenced in national reduction of armaments. We have got to tide over a certain period. There the Locarno and Washington Treaties will help. But the idea of outlawry of war ought to have an accumulative effect. Good ideas often have, you know."

"Yes, I suppose they have," said the soldier. "But there is another aspect of this peace problem which seems a bit shaky to me. Doesn't it depend to a large extent on the integrity and worthiness of various gorvernments? I am not thinking so much of deliberate breaches of the peace or repudiations of treaties as of the effect of sheer bad government. Take our last two big wars. Were they not caused by stupidity, or worse, on the part of governments? Spanish misgovernment of Cuba, to say nothing of the sinking of the *Maine*, brought about an intolerable situation. German govenmental mishandling of the submarine campaign and their incredibly stupid note to Mexico brought about an impasse equally hopeless for peace. The War of 1812 and the Mexican War came about in much the same way. Perhaps the art of government is improving. But I am wondering if real international peace must wait until the least dependable of governments can be trusted never to make an intolerable nuisance of itself. If peace must wait on that day, is it not likely to wait a long time?"

"The answer to that, I think," replied the professor, "is the growing habit of conferences and cooperation between nations, the habit of what we know in common-sense American business as 'get-together, give-and-take.' In a world being bound together closer and closer every day by trade and transportation, it is going to be increasingly difficult for any nation not to play the common game. And as the community spirit between nations grows, we shall get rid of the old idea that the only recourse in an intolerable situation is the egotistical method of war."

"That is probably true," the soldier admitted, "but I was not thinking so much of the means by which various governments may be made safe for peace as of the necessity for doing so,—as well as for building up international peace machinery. Since peace is an international chain of which the nations are links, the weakest link involved in any given strain is the one which must be up to standard. During the period in which you are fitting your chain of nations to some workable mechanism of peace, and also tempering your weak links to bear the constant strain of good government—two distinct tasks—I suppose we soldiers and sailors will be expected to furnish such security from war as may be possible?"

"Yes, but how much is that?" demanded the professor. "You say you armed men are instrumentalities of statecraft. In this modern world statecraft will probably continue to desire peace—I am speaking generally of the civilized world, not of exceptions. Can *you* do the trick—can *you* maintain peace?"

"Well, I give you back your own answer—yes and no," replied the soldier. "Peace by armed force means some form of balance of power. There may be two opposing alliances, as there were in Europe before the war, or there may be several groups and a few strong powers playing lone hands, as there are today. But in any given crisis it is a question of balance of interest and power. From the point of view of peace, it is a question of time. Your balances may be sufficiently stable for many years; but since the factors which enter into them are very complicated and are constantly changing, growing relatively

stronger or weaker as the various nations progress, obviously the time will come when the scales do not balance. The long strain of waiting for that moment may add greatly to the disruptive effect of an incident. Nineteen-fourteen proved that to the hilt. A shot in an obscure Balkan town upsetting the world! And while suspicion holds, look out for 'preventive' wars—wars to prevent the other fellow making war when he gets strong enough. Also, while hate is with us look out for wars of revenge. There is still a lot of both explosives lying about."

"That's frank, at any rate, and much the way I should size it up myself. But you are an American soldier, and America means to keep out of the balance of power and competitive armaments and all that sort of thing. How do you look on your own job? What sort of a peace-insurance for this country are you, anyway?"

"Pretty good, I should think," the soldier replied, "until your millennium comes into its own. But first get this straight—we soldiers and sailors do not decide on whether there shall be war, ever. Statesmen do that. And the other fellow's statesmen may force the issue, as they did in 1917. Very well. Since our statesmen are presumably pacific, since our people sincerely renounce aggression, what are our military forces but instrumentalities of peace? We make it difficult or dangerous for the other fellow to attack us—that, and nothing more. So I may in reality call myself a pacifist,—a practicing, professional pacifist, my worthy idealist, and I don't wince at the word either! . . . But you asked how much we are worth as peace insurance. About as much as you make us, I should say. As much as the sincerity of your desire for peace is worth, and the power you put in our hands to prevent foreign aggression. Since you like equations, put it down that your peace insurance equals your will-to-peace multiplied by your military force. That's simple. But don't deceive yourself into thinking that America is out of the range of the balance of power. That complication is not European, but world wide. National interests interlock and clash all over the map. And, as we grow as a producing and exporting nation, we are bound to get into it deeper and deeper. We are going to find that will-to-peace is not as simple as it sounds. National interests far beyond our frontiers will sometimes have to be compromised or even sacrificed if we are determined to maintain peace."

"Well," said the professor, "I withdraw what I said about America being out of the orbit of the balance of power, since you extend it to the world's ends. But I don't know about that equation of yours. I am afraid it's not quite right. 'Peace insurance equals will-to-peace times military force.' Um! Then if we should reduce our military force to zero, by your equation our peace insurance would also vanish to nothing, however strong might be our will-to-peace. In other words, you think our chances of peace depend directly on our military force?"

"Yes," the soldier agreed, "as well as on your will-to-peace. Don't forget that. Let that vanish, or sink your fleet and disband your army, and in either case your insurance against war goes glimmering."

"All right," conceded the professor. "But look at it in another way. Suppose we double our military force. By your equation we thereby double our insurance against war. That's nonsense! Double the American Navy, to say nothing of the Army, and see what happens. Talk about shattering the balance of power! Why man, you would raise such a crop of suspicion, such a race in armaments that only by a miracle could we avoid war in the long run."

"Ah—I might have known that it was dangerous to feed a professor equation!" said the soldier regretfully. "But don't you see that military force must always be relative to the task you want it to accomplish? What I meant, in my simplified formula, was military force considered in terms of its ability to prevent foreign aggression. That is the main purpose for which the United States keeps her armed forces. If we doubled our strength, and if that brought about a race in armaments in which possible antagonists approximately doubled theirs, we would be just where we were when we started. The value of our peace insurance would not have been changed, since we had changed neither our will-to-peace nor our military power to prevent aggression. I admit you can exaggerate dependency on military force to the danger point. But you can also get into trouble by being supinely pacific. Do you remember Kinglake's remark about Lord Aberdeen, the British Premier who got his country into the Crimean mess—'He drew down war by suffering himself to have an undue horror of it'? My little equation was only intended to express the generalization that you cannot secure peace by pacific intentions alone, any more than you can by military force alone. Peace is their product."

"That sounds all right," the professor admitted. "The olive branch grafted onto the big stick! But let's look at this military force of yours in the light of its ability to prevent foreign aggression. The trouble with you soldiers and sailors is that, while you talk defense, you always ask for offensive weapons. Just how defensive is this force with which you propose to discourage anyone who might have hostile inclinations towards us?"

"Look here, Bill. That boy of yours is somewhat pugilistically inclined, isn't he?" asked the soldier.

"My boy? Well, he gets into a scrimmage once in a while, but he is not a fool about it. What of it?"

"You mean," the soldier said, "that he likes to have a sporting chance when he mixes it up with another fellow? A normal lad, in other words. Now, suppose you warn him not to tackle Johnny Jones, and tell him that although Johnny never hits back, he is a wizard on covering up and blocking blows. Your boy would probably say: 'Aw, I can lick that guy.' And he could! No defense is proof against vigorous, sustained attack. But tell him he better lay off Tommy Smith, because Tommy carries a powerful wallop. Which of those two youngsters do you think your boy's youthful pugnacity would be the more likely to respect?"

"I see. Then you military men propose to discourage foreign aggression by being ready to strike rather than to shield. The old theory that the best defense

is a good offense. As a peace proposition that does not altogether commend itself to the layman. It might so easily be stretched too far."

"Yes, of course it can," the soldier agreed. "But let's apply it to our own case here in America. Our real strength lies in our enormous potential power. It is the power we apply daily to commerce and industry. When converted into military force it is far and away the most formidable thing in the world today. And it will continue to be overwhelming as long as we retain our supremacy in wealth and production. But—and here is the point—*it takes time and lots of it* to convert that potential power from a peace force into a war force. We have got an awful wallop, but we cannot use it unless we can hold off the other fellow for a year or more while we are getting it ready. Much damage can be done in a year, as you know. Now, if we also maintain sufficient military force, in the shape of immediately available men, guns, planes, and ships, to block any possible blows until our full strength is developed, we will be a pretty discouraging proposition. Uncle Sam will be known as the lad who has Johnny's defensive skill plus Tommy's renowned wallop. Not a fellow to tackle offhand!"

"Well, that puts it in a better light. If that's your story, you better stick to it," the professor advised. "It ought to be a fairly good answer to the rather prevalent impression that what you military men really mean by adequate defense is having one more regiment and one more ship than the other fellow. However, I suppose that, in blocking the other fellow's blows while you get your wallop ready, as you put it, you don't necessarily mean to confine yourself to defensive measures only. The fleet and the air forces would not seem to fit into such a picture."

"No," said the soldier emphatically. "We will keep the war off our own territory and trade routes if we can—push it out into the other fellow's and hold it there. War, as you may remember, does not improve the land on which it is fought."

"Yes, I remember," the professor admitted sadly. "If we must have war, let's not fight it on our own soil, as the French had to do. . . . But there are still two counts against you soldiers. The first is that you are so preposterously expensive. Isn't it eighty-three cents out of every tax dollar that we have to pay for you and your wars? Something like that. Since you admit that you cannot be sure of keeping the war clouds away from this fair land, isn't that a rather steep price to pay for your form of insurance?"

"Dear old eighty-three cents," the soldier mused. "How the pacifists do love to get them out and rattle them! As it happens, I have the actual figures on that famous tax dollar with me. I looked them up in government statistics only the other day. What you actually spent, Mr. Tax-payer, on your regular and reserve forces, land, sea and air, in the fiscal year 1927 was $586,805,403.34. Since the total of the federal receipts for the same year was $4,812,516,430.10, your military item came to a little over twelve cents on your federal tax dollar. The rest of that well-worn eighty-three cents went for debts contracted when you chose to go to war in the past (regardless of the fact that you were unprepared

for that ordeal); also for your amiable habit of pensioning your war veterans for a fantastic time after the show is over; also for the maintenance of the Panama Canal and for improvements in rivers and harbors, all charged to the much maligned War Department. Now, your motives for going to war in the past, prepared or unprepared, were beyond doubt exemplary. Your paternal care for your ex-service men is most praiseworthy. And I dare say your rivers and harbors need funds. I do not criticise. I merely point out that these things are not chargeable against your future military security."

"Still, eighty-three cents on the dollar for past wars and future security (such as it is) seem a lot to a poorly paid professor."

"Yes," the soldier said, "many worthy pedagogues have been horrified when they compared that eighty-three cents with the two-and-a-half cents spent on education from the same dollar. But it happens to be a federal dollar. And since when has education been a primary function of the federal government? It is not mentioned in the Constitution. It is a local issue. State, municipal, and county taxes cover it. Now, of your various local assessments, only your state tax includes any military expenditures whatever. And your state tax dollar gets cut down only about nine-tenths of a cent (on the average) for military purposes, for the national guard and naval militia."

"You mean, then," the professor suggested, "that the federal budget, in which the military expenses appear as a considerable item, is only a part of the total revenues raised by taxation, direct or indirect?"

"Yes, that's it," said the soldier. "To get the picture as a whole, take the fiscal year 1925, the latest for which all figures, federal, state and municipal, have been compiled. In that year the total revenues of the federal government and of all the states and of all the cities of thirty thousand or more population came to $8,866,292,684.42. The actual cost in the same year of the army, navy, national guard and naval militia—your total preparedness bill—was $587,398,-739.88. That works out at a little less than six-and-a-half cents on your tax dollar, without counting the small town and county taxes, all of which went for non-military purposes. Quite a different proposition from eighty-three cents on the dollar, isn't it?"

"Ah, but you miss the main point," the professor insisted. "I am not so much concerned with what you soldiers and sailors cost (though that is enough) as with the appalling waste of the present system. You may only cost me six-and-a-half cents on the tax dollar, but so long as wars are possible I and all my descendants must go on paying for you *and* for old wars. And that means a very big drain indeed on my dollar. I grant you that you are not directly responsible for wars. I remember that Secretary Baker, who certainly had reason to know you and who is far from being a militarist, publicly asserted that no record exists of an American soldier or sailor urging his country into war. But wars do come upon us, nevertheless. I believe our average so far is a big one every thirty-three years. And that's what we are sick of—the whole war system, with its stupid barbarity and endless drain even in periods of peace."

"Of course you are," the soldier agreed. "But the point is to devise a new system, and one you are sure will work, before you discard the old. In the meantime there is not much use in your complaining about your bill for the present one, even if it does include an item which you may consider unnecessary —my pay check. . . . But just what did you mean by saying that you acquitted me and my kind of 'direct' responsibility for war? Do you think we exert an indirect influence towards war? Is that your second count against us?"

"Yes," said the professor. "The very existence of armed forces prepared for war exerts an indirect influence toward it. Go back to Homer—he put it clearly enough: 'The view itself of arms incites to their abuse.' You cannot avoid the psychological effect of preparedness for war. It is a tacit admission that the war system exists. It tends constantly to make people think of war as the ultimate means of decision. Take any force you like, build it up and maintain it through the years. There will follow a natural, inevitable tendency to use it. It cannot be held in suspense indefinitely without exerting a great pressure."

"I wonder," the soldier asked, "which is the more dangerous to discuss with a professor, equations or psychology? Personally I should have doubted that our small and scattered army and our rarely seen navy could exert any influence whatever on the mind of this huge and busy nation. I rather thought that we had to be at some pains every now and then to obtain recognition of even our most pressing needs. It might be flattering to our egotism to think that our modest presence in your midst led you subtly to think of using us as a flaming sword. But I am afraid it would be rather a strain on the imagination. ' "Who are you shoving?" said the elephant to the flea.' . . . No, I am afraid I cannot agree with you on that blessed word 'psychology,' save in so far as our presence is a sign and symbol that the war system still exists. But there our influence should be counted as good. We are your constant reminders that you need a better system, and have not yet devised it."

"You are that and more, soldier-man. Look at the material interests lined up behind your armies and fleets. Financially and industrially there is big business backing you. Assume if you like that every business man knows that war is an evil thing and an extremely hazardous risk for his house. Yet there are those peace-time contracts for your maintenance. They are fat and tempting. In taking them a man's conscience is soothed by the idea that he is helping to provide legitimate means of national defense. So he helps to keep the ball rolling, and you going. And when war comes—well, of course it isn't his fault, and his obvious duty is to provide still more of the wherewithal."

"Oh, come now," the soldier protested. "Isn't that stretching it a bit too far? Even were the equipment and supply of the army and navy obtained wholly through private industry, which of course is by no means the case, the business interests involved would hardly be a drop in the bucket in this country of ours."

"Ah, but every drop counts when it is in the wrong bucket," the professor insisted. "And how about your influence in schools and colleges, your training units of men and boys, your very extensive summer camps? Can you deny that there you are exerting a war, or at least a force influence (much the same

thing) on youths of a very impressionable age? Take the C. M. T. C. You offer practically any boy a free camp for a month in summer. You give him advantages (in his eyes) no one else can offer—military bands, uniforms, flags, guns, and equipment of all sorts. And then you train him to bear arms. Do you fancy you can do this without leading him to think of war as the natural order of things, and rather fun?"

"My dear man," protested the soldier. "Must I keep on reminding you that you have not yet taken war out of the natural order of things? We are only ten years away from the greatest of wars. And since that 'war to end war' there have been major outbreaks of the old evil in Poland, Morocco, and Anatolia, to say nothing of countless minor affairs—more actual fighting than occurred in the decade after Waterloo. There is no getting around it, war still occurs in 'the natural order of things'; and if you choose to let your youth remain wholly untrained for it, you take certain obvious and unpleasant risks. The fact is, you scientists, with your great advances in transportation and production, have made of war an affair of the entire manhood of the nation, not alone of its professional soldiers and sailors. Therefore, so long as war exists, your manhood must be prepared, to some extent at least, if you value national security."

"Well, perhaps a certain amount of preparedness will be necessary until we work up some other security from war," the professor admitted. "But you stray from the point—the influence of your training on youth. A healthy boy learns to look with tolerance, at least, on any game in which he takes an active part. Give him even a month at the handling of arms, and if he makes any progress at all (which he will), he will be a queer one indeed if in the future he regards with greater aversion 'that mad game the world so loves to play.' "

"Another professor said that, didn't he?" remarked the soldier. "But do you really believe that a youth of the C. M. T. C. or R. O. T. C. carries home with him any stronger bent towards war than a tacit understanding that it is still a live issue between nations? Or is this truth alone so baneful?"

"I am afraid he carries away a lot more than that," said the professor. "When you get an educator of the eminence of John Dewey worked up into believing that you are deliberately trying to militarize this country through the medium of schools and colleges, you should realize that there is something in it."

"Professor Dewey," the soldier conceded, "ought to know more about a boy's reactions than I do. I wonder if he knows as much about our camps and what we give the boy to react upon? Of course we try to teach the rudiments of the military game. But we realize that we can teach only the rudiments; and so we put our real emphasis on character-building, on self-reliance and manliness, on team-play, discipline and patriotism in the sense of good citizenship. I understand that these virtues are in good repute in walks of life other than the military. They should be, for look at the other side of the picture—your wild youngsters, your young gunmen. They get that way, not through training and discipline but because of the lack of them. Also the boy in camp gets quite an insight into matters of personal hygiene. And in rubbing up against his

fellows he perhaps learns more about democracy than he imagines. Again, he is getting something of use to him. To what extent several hours of drill a day will make him bellicose, I don't pretend to know. That they cannot make him a finished soldier is obvious. It is perhaps for that reason, or perhaps because we are really trying to serve the country, that we put our main effort on character-building rather than on soldier-making. And it is certain that his drills do not cut down his zest for sports. I wonder if you realize the time and money we spend in providing athletics for those camps, the care with which they are supervised, and the effort we make to insure that each boy gets his full chance? I may be entirely wrong, but what I have seen of the camps leads me to believe that a boy is likely to take away with him much the same impression he would get from any of the thousands of well-run civilian camps. I suspect that his outstanding impressions are of a month of vigorous exercise in the open, of companionship and keen competition with his fellows, of satisfaction in having felt himself part of a team, of having learned to obey and perhaps also to give orders, of some hard work, and of some of the fun of youth. For this he has paid, not in money as in a civilian camp, but in service. Whether he carries away with him the virus of war, as you and Professor Dewey seem to think, is open to doubt. But of this I am sure—he is a better citizen. He is a better citizen because he knows that in a measure he has served the state. He is at least not wholly unprepared to render that most crucial service which his citizenship may some day demand. Against this gain, and against all the health—mental, moral and physical—which we can and do give him, you set the vague fear that in handling arms he may have developed a desire to use them! Well, my friend, I can only say that you have a much lower opinion of the soundness of American youth than I have."

"Your flank movements around the main issue may be good tactics, my soldier-friend, but they are unconvincing. Youth is of the essence of the problem, since we must train the next generation or two to think in terms of peace and not of war. Preparedness for war is of course your job. What you cannot see is peace preparedness. That means not only will-to-peace, but also a public mind prepared to accept a peaceful settlement of any conceivable crisis, and to reject the idea of war wholy and without question. Wars, as you know, are commonly made by minorities. The great mass of people accept them because they have been trained through untold generations to regard them as the normal means of meeting national crises, of preserving national honor, etc. That war-mentality we must replace by peace-mentality. And that means the training of youth to peace, not to war. I dare say your training camps produce many worth while by-products in the form of sports, hygiene, etc. But it is not by-products I am talking about. It is the essence of the thing —the reaction of this coming generation to war."

"Yes," said the soldier gleefully, "and as a final *reductio ad absurdum* in your attempt to teach the young to think as you want them to think, I understand that it is proposed to take away the kids' tin soldiers and pop guns and banish *Paul Revere's Ride* and *The Man Without a Country* from their book

shelves. How Mars must laugh! Before you have solved your own man-sized problems, before you have even codified the laws of your international life, you piddle with children's toys and boys' camps. It's funny—and fatuous! You are up against the hardest proposition collective man has ever tackled. You know perfectly well that you have by no means reached a sound and sure solution. You know that our government, the elective head of the most peace loving people in the world, is not now and never has been convinced that the era of wars is over. You know that we are now building up our Navy, having recently failed to reach an agreement to limit shipbuilding on the relatively minor point of cruisers. You know that we have turned down the one outstanding international organization for the suppression of war. You know that we still consider ourselves bound by the Monroe Doctrine to protect practically this entire hemisphere from any attempt at foreign domination. You know that we have made no pledges on the future to submit to any form of international decision any questions which we may choose to consider either as domestic or as pre-empted by us under the Monroe Doctrine. And, knowing all this, you would say to the youth of this country: 'Shut your eyes to the fact of war. Don't think of it. And perpetual peace will come to you or your children'!"

"Whew!" exclaimed the professor. "It seems to me that somebody else is flaring up a bit! I don't know that I am advising young men to shut their eyes to facts—it's not considered ethical in my profession. I should rather that they kept their eyes very much open to the trend of the times, and particularly that they should not forget what I think you called the realities of war. I am rather keen that the next generation should carry on towards the goal, and not slip back into our old ways. And I am afraid you are not helping much in that respect."

"Perhaps not," the soldier replied. "My business is national security, not international reform. But the truth is, our generation said we were going to do away with war—and we have not made good. The on-coming generation know this, and when they think about it they are apt to conclude that we made a mess of a great opportunity. I am not sure but that they are right. At any rate they will get their chance to tackle the problem in their day. Perhaps they will do better than we have done. I hope they will. But until their day comes, let us at least be honest with our sons and daughters. Let us at least not pretend that we have accomplished more than we have, nor lull them into a sense of false security. Better, a thousand times, say to them frankly, as we soldiers do in substance say: 'The world is groping towards peace. It may in time attain it. In the meanwhile we carry on under the old system of national security by preparedness. It has its obvious disadvantages. It is the standing proof that the goal has not yet been reached, that humanity has not yet learned to govern itself. But, taking the world as it is, we believe that it offers the only road to reasonable security for our national life'.—And, old man, we wait on you to better it."

Annual Report of the Chief of Coast Artillery

Extracts

1. General.

a. For the Coast Artillery Corps the outstanding features of the fiscal year 1928 have been:

(1) Resumption of seacoast artillery battle practices in the United States;

(2) Improved tactical training incident to concentrations on both east and west coasts;

(3) A general improvement in artillery technique;

(4) Standardization of artillery practice methods, including the scoring system, and the preparation of a training regulation covering this subject;

(5) The adoption of a new system for controlled submarine mines;

(6) Revision of defensive sea area plans;

(7) A rapid advance toward standardization of sound-ranging equipment and antiaircraft gun equipment, and hopeful progress toward solving the problem of antiaircraft machine-gun fire at the longer ranges;

(8) Initiation of studies for the antiaircraft defense of important localities;

* * * * *

(10) An increased strain upon personnel generally to maintain high standards of training and appearance and at the same time to care for the valuable installations in their charge.

Most of the foregoing are discussed in greater detail under appropriate paragraphs below.

b. With the issue of G. O. 22, W. D., 1927, the missions of the Coast Artillery have been logically defined and the embarrassments to instruction and to preparation of training regulations removed. Responsibility for heavy trench mortars has been transferred to the Field Artillery, leaving the Coast Artillery charged only with the development and use of weapons intended for fire on moving targets (naval or air) and of the auxiliaries necessary for control of such fire.

c. During the year reported upon the undersigned witnessed the battle practice at Fort H. G. Wright, N. Y., and has inspected the harbor defenses of the First, Second, Third, Fourth, and Eighth Corps Areas, the 61st and 62d regiments (AA), the 51st Coast Artillery (TD), the 52d Coast Artillery (Ry), and the Coast Artillery School. Incident to these inspections the following Coast Artillery R. O. T. C. units were visited: Georgia School of Technology, The Citadel, Kansas State College, University of Kansas, Washington University, University of Cincinnati, and the Virginia Polytechnic Institute. The Training Camp at Fort Knox, Ky., also was visited. In all fifty-two days were devoted to visits and inspections.

d. Assistants in the Office, Chief of Coast Artillery, attended the battle practices at Fort Story, Virginia, and Fort H. G. Wright, N. Y.

2. PERSONNEL.

a. Regular Army Commissioned Personnel.

(1) On June 30, 1928, the number of officers in the Coast Artillery, including those commissioned in the arm and those detailed for duty with it from other arms, was as follows:

	Cols.	*Lt. Cols.*	*Majs.*	*Capts.*	*1st Lts.*	*2nd Lts.*	*Totals*
Commissioned in Coast Art'y. . .	58	60	221	280	221	184	1024
Detailed from other arms			3	4	6	3	16
Totals	58	60	224	284	227	187	1040

(2) The distribution of the commissioned personnel of the Coast Artillery on June 30, 1928 (assigned status) was as indicated below:

	Maj. Gen.	*Cols.*	*Lt. Cols.*	*Majs.*	*Capts.*	*1st Lts.*	*2nd Lts.*	*Totals*	*Authorized*
Total No. of officers on Br. Duty	(1)	(28)	(18)	(114)	(229)	(173)	(146)	(709)	(715)
With C. A. Units .	1	28	18	101	188	149	142	627	635
Special Serv. Schools				13	41	24	4	82	80
Detached Duty		(28)	(36)	(104)	(46)	(50)	(2)	(226)	285
Detailed in G. S. C.		6	12	15				33	
Military Attaches		2	1					3	
Army War College (Staff)		1	1	1				3	
Army War College (Students) . . .			1	8				9	
C. & G. S. School (Staff)		1	2	5		1		9	
C. & G. S. School (Students) . . .			1	18	6			25	
National Guard . .		1	4	14	9	10		38	
Organized Reserves		12	8	13	4	1		38	
R. O. T. C.		4	1	21	17	11		54	
Inland Waterways Corp.		1						1	
Recruiting			1		3	6		10	
U. S. M. A.			1	5	3	12	1	22	
Misc. Details . . .			3	4	4	9	1	21	
Detailed with Other Branches		(1)	(3)	(3)	(7)	(10)	(10)	(34)	
I. G. D.		1	3	2				6	
Ordnance Dept. .					2	4	6	12	
Signal Corps . . .						3		3	
Air Corps						1	4	5	
Chemical Warfare Service					3			3	
Quartermaster Corps.					2	2		4	
Quartermaster General's Dept.				1				1	
	1	57	57	221	282	233	158	1009	1000

(3) The following table shows the progress made in passing officers through the service schools;

	Field Officers	*Capts.*	*Capts.*	*1st Lts.*	*2nd Lts.*	*Total*
Army War College—Grad.	72					72
C. & G. S. S.—Grad.	208	9				217
Adv. Cr., C. A. S.	211	17				228
* Eligibles to attend (next 5 yrs)	44	116				160
B. O. Cr., Grad.			198	112	2	312
** Eligibles to attend			75	111	185	371

* Includes all majors who have not had the course, one lieutenant colonel, and all captains to be promoted within next 10 years.

** Includes all battery officers who have not had B. O. Course, except 7 captains who have graduated from Command and General Staff School, 3 captains who have been excused, and 2 lieutenants who are too old.

Under the present policies it is expected that for the next few years the Advanced Class, Coast Artillery School, will be composed of about 22 students, the Battery Officers' Class, about 56, the Command and General Staff School about 16 (16 entering each year) and the Army War College about 9.

(4) In the assignment of officers every effort has been made to reduce to a minimum the number of moves. The success of these efforts has been marked and it is the exception when an officer is moved before he has served at least two years on any one assignment.

(5) Seventeen per cent of the field officers and thirty-two per cent of the battery officers commissioned in the Coast Artillery Corps are on foreign service.

(6) It has been impossible to keep the assignments of commissioned personnel to organizations and harbor defenses up to strength due to the number of officers detailed to duty other than branch duty. At the present time there is a shortage of 13 officers for assignment to Coast Artillery units. The maximum number short for duty with organizations at any time during the year was 23; this occurred just prior to the assignment of the graduating class of the United States Military Academy.

b. Reserve Officers, Coast Artillery.

(1) Distribution of Coast Artillery Reserve Officers, June 30, 1928:

Group	CORPS AREA									*Pan. Dept.*	*Haw. Dept.*	*Phil. Dept.*	*Total*
	1st	*2nd*	*3rd*	*4th*	*5th*	*6th*	*7th*	*8th*	*9th*				
G. A. Group . .		1	1	1	1								4
B. A. Group . .													
Authorized . .													402
Available . .	15	21	48	110	12	28	6	57	6	2	4	3	312
* Unassigned													25
T. A. Group . .													
Authorized .	436	487	589	243	193	94	133	33	529				2737
** Available .	517	562	660	612	221	395	453	119	526	2	22	6	4095

* Ineligible for assignment and residing abroad.

** Does not include National Guard officers holding Reserve commissions.

About .05% are in the grade of colonel; 1% in the grade of lieutenant colonel; 4% in the grade of major; or a total of 5.05% in the field grades.

(2) Reserve Officers, B. A. Group by grades, trained during the fiscal year ending June 30, 1928:

	15 Days	*More than 15 Days*
Second Lieutenants	15	1
First Lieutenants	9	1
Captains	9	
Majors	3	
Lieut. Colonels	2	
Totals	38	2

Of this number the following have received active duty training during each of the three fiscal years, 1926, 1927, and 1928:

Lt. Col.	*Major*	*Captain*	*1st Lt.*	*2nd Lt.*	*Total*
1	2	4	2	1	10

c. *Distribution of Enlisted Men.*

	U. S.	*Pan.*	*Haw.*	*Philippines*		*At Sea*	*Total*
				Am.	*Phil. Scouts*		
Present authorized strength (G. O. 7, 1926)	5314	2253	3000	1200			11,767
Authorized G. O. 30, 1924 .					2400		2400
Total Authorized . . .							14,167
Actual strength, American May 31, 1928	5495	2085	2842	1206		40	11,668
Actual strength, Phil. Scouts April 30, 1928					1531		1531
Total April 30, 1928 . .							13,199

d. The enlisted strength of the Coast Artillery Corps (not including Philippine Scouts) actually on duty with units of the arm has been reduced from 25,606 to 11,668 since 1921. The change in authorized grades and ratings during the same period is shown in the following tables:

Grades

	Master Sgts.	*Tech. & 1st Sgts.*	*Staff Sgts.*	*Sgts.*	*Corps.*	*Pvts. 1st Cl.*
1920—Bul. 25 . . .	215	498	576	2673	3184	7381
1928—G. O. 7, '26 .	93	225	341	998	1200	2999
Loss	182	273	235	1675	1984	4382

Ratings

	1st Cl.	*2d Cl.*	*3d Cl.*	*4th Cl.*	*5th Cl.*	*6th Cl.*
1920—Bul. 25 . . .	44	115	385	686	1011	2137
1928—G. O. 7, '26 .	19	8	75	340	351	839
Loss	25	107	310	346	660	1298

e. The assignment of the personnel has changed as follows:

	Overseas			United States				
	Panama	*Hawaii*	*P. I.*	*Har. Defen.*	*Anti-Aircraft*	*Ry. Arty.*	*Trac. Drawn Arty.*	*Sound Ranging*
1921 .	1728	2429	2693	10,649	0	2357	5750	0
1928 .	2085	2842	1206	3459	1141	457	353	125
Change	+ 257	+ 413	—1487*	— 7190	+1141	—1900	— 5397	+ 125

* Compensated by assigning 1531 Philippine Scouts.

* * * * *

3. Training.

a. General.

Considering the various conditions Coast Artillery organizations serve under in our overseas and continental garrisons, progress in training of all units during the year has been praiseworthy.

b. Gunnery and Target Practice.

(1) *Seacoast Guns.*—The following table gives comparative results of firings for the calendar years 1926 and 1927:

	No. of batteries		*Average range*		*Average percentage of hits*		*Av. time per rd. of record fire in secs.*		*Hits per gun per min.*	
	1926	*1927*	*1926*	*1927*	*1926*	*1927*	*1926*	*1927*	*1926*	*1927*
3″ S. C.	4	4	4220	3985	34.10	40.52	21.20	12.44	1.222	1.826
6″ B. C.	3	3	8783	7963	7.10	35.94	52.20	21.01	.194	1.466
6″ D. C.	6	6	7503	8410	28.60	31.16	29.70	22.12	.704	1.050
155-mm.	14	14	8550	10,120	20.00	17.69	27.30	23.20	.481	.496
8″ Ry.	2	2	12,926	12,598	34.00	25.00	126.70	62.51	.260	.224
10″	4	2	8972	8654	29.90	30.00	63.10	68.93	.308	.272
12″ D. C.	3	5	11,008	11,651	39.60	32.00	54.90	65.69	.550	.301
12″ B. C.	5	5	13,550	18,985	18.50	6.66	76.90	85.16	.159	.057
12″ M.	15	14	10,572	10,646	12.70	18.13	87.40	71.82	.120	.157
12″ M. (Ry.)	4	4	12,245	9796	16.30	10.71	106.00	128.47	.099	.134
14″	7	6	15,471	16,111	4.30	8.33	58.20	56.30	.057	.083

Analyzed, we find that 75% of the batteries fired at greater speed, the improvement being especially marked for the rapid-fire armament. Greater range was attained by 77% of the batteries. Fifty-four per cent of the batteries improved in accuracy, the greatest improvement being noted for rapid-fire armament. In hits per gun per minute improvements is noted in 78% of the batteries firing.

* * * * *

(3) The improvement in seacoast artillery practice is attributed to the system of competition introduced in 1926. Although not favorably received by some officers, there has been a general increase of accomplishment, interest, and enthusiasm. This is far more notable in the reports of those target practices for the calendar year 1928 which have been received to date than in the practices reported upon above.

c. Tactical Training.

(1) *Battle Practices.*—Battle practices were held in each of the defended overseas possessions, at San Francisco, California, at the Harbor Defenses of Long Island Sound, and at the Harbor Defenses of Chesapeake Bay. While practices of this kind have been held from time to time in overseas possessions since the World War, inadequate personnel and other causes have prevented in the United States. The allotment of funds for troop movements incident to Coast Artillery training in the United States for the F. Y. 1928 enabled concentrations to be affected at the three harbors named. This gave valuable train-

ing to the higher echelons and has the added effect of placing in service some batteries and installations normally without manning parties, thus enabling us to ascertain the true condition of equipment. It is hoped to synchronize the annual encampment of National Guard units and the active training of Reserve Officers with these battle practices in future so that the more important harbor defenses in the United States may be placed, in turn, approximately on a war footing.

(2) *Joint Exercises—Army and Navy.*—Minor joint exercises were held in the United States during the troop concentrations for the battle practices, the Navy furnishing in each instance such vessels as could be made available. In the Panama Canal Department a joint communication exercise was held in connection with a minor joint exercise off the Pacific entrance to the Canal, Army and Navy aircraft participating, as well as the Navy Control Force and the Harbor Defenses. The exercise was of considerable value to the harbor defense troops, but the greatest benefit derived was from ascertaining, in a practical manner, methods of coordinating the several systems of communication.

Extensive Joint Army and Navy exercises were held in the Hawaiian Department, in which all Coast Artillery units took part. That department apparently offers the best field for training of the combined arms in coast defense, with the Panama Canal Department a close second.

No report as to Joint Army and Navy exercises in the Philippine Department for the year reported upon has been received in this office.

While excellent results in tactical training are obtained at joint exercises, such as those held in the United States this year, it can not be denied that much is lost through the absence of mobile forces at these exercises. Even when these are only outlined by establishing the higher command posts for the defense of a section of the shore line, and a general attack is developed under the control of competent umpires, a sense of reality is introduced that enables these exercises to approximate in value those held in overseas possessions. Only one such exercises has been held in the United States since the World War—that in the Narragansett Bay Area noted in my report of last year. It is hoped such exercises may be made an annual feature of our training in the more important coastal areas.

(3) *Joint Training, Coast Artillery—Air Corps.*—The Air Corps has been generous in supplying the planes necessary for Coast Artillery training but reports received indicate that, with two exceptions, lack of means has prevented progress in testing the regulations for joint employment of the Coast Artillery and Air Corps. The exceptions referred to are the Hawaiian and Panama Departments. In the former such joint action was featured in the exercises referred to in (2) above. In the latter a special exercise of attack and defense was featured. Plans were made for joint exercises in the Harbor Defenses of Chesapeake Bay but these had to be abandoned as the Air Corps was unable, without material curtailment of scheduled training, to supply planes and airships in numbers sufficient. The training text referred to will necessarily have to be continued as a tentative regulation for the time being.

(4) *Troop Movements.*—All mobile Coast Artillery units, except the 51st Coast Artillery (TD), have made more or less extensive movements from home stations during the year. The 61st moved to Aberdeen Proving Ground, Md. for duty during the antiaircraft tests; the 62d to Fort Tilden, N. Y., for target practice; the 63d to Capitola, Calif., for tactical exercises and target practice. The 1st Sound Ranging unit moved to Aberdeen, Md., and established its sound ranging stations under field conditions. The 52d Coast Artillery (Ry) moved from Fort Eustis, Va., to Fort Story, Va., and established batteries and communications under conditions that would be normal for beach defense or for harbor defense in war. While the 51st Coast Artillery (TD) has at Fort Eustis, Va., terrain well adapted to its training, plans are in preparation to include that unit in the movement to Fort Story during the next practice season.

d. The Coast Artillery School.

(1) Except for a rearrangement of the Battery Officers' Course, with a view to accentuating further the practical side of the instruction, the courses at the Coast Artillery School have continued substantially as described in my annual report for 1926. The full report of the Commandant has been forwarded to the War Department.

(2) The following tables show the number of students in each department during the past year:

OFFICERS' DIVISION

Course	*Duration*	*No. Completing Course*
Advanced	9 months	32
Advanced Engineering	4½ months	3
Advanced Gunnery	4½ months	3
Battery Officers'	9 months	48
Refresher	Varied	5
Battery Officers' for National Guard and Organized Reserves	1½ months	27

ENLISTED MEN'S DIVISION

Course	*Duration*	*No. Completing Course*
Electrical	9 months	26
Master Gunners'	9 months	5
Radio	9 months	5
Clerical	4½ months	36
Special Radio, National Guard	2½ months	13

(3) In addition, the Department of Correspondence Courses has prepared seven and revised two subcourses, has submitted the texts of five original training regulations and revisions of eleven training regulations; and has initiated work on several additional training regulations, correspondence courses, and field manuals.

e. The Coast Artillery Board.

(1) This Board acts as an advisory agent to the Chief of Coast Artillery. The following are the more important projects considered by the Board during the past year:

Gas proofing plotting rooms, seacoast batteries.

Ford Gun Data Computor.
Self-synchronous Data Transmission System.
Improved range and deflection correction devices.
Aerial Spotting.
Arrangement of antiaircraft guns and fire-control instruments (determination of effect of blast).
The antiaircraft trial shot problem.
Fire control, antiaircraft machine guns.
Binaural training.
Sound-ranging equipment.
Motor transportation for Coast Artillery Corps.
Gunnery and analyses of target practice reports.

(2) There follows a summary of work accomplished and remaining on hand:

Projects on hand July 1, 1927:			
(*a*) Referred to Board by OCCA	27		
(*b*) Originated by Board	4		
		31	
Projects received and initiated during year:			
(*a*) Referred to Board by OCCA	53		
(*b*) Originated by Board	10		
		63	
Total projects considered			94
Status of Projects:			
(*a*) Referred to Board by OCCA:			
(1) Completed	62		
(2) Uncompleted	18		
		80	
(*b*) Originated by the Board:			
(1) Completed	8		
(2) Uncompleted	6		
		14	
			94
Projects on hand July 1, 1928:			
(*a*) Referred to Board by OCCA	18		
(*b*) Originated by the Board	6		
		24	

f. Training of Civilian Components.

(1) *National Guard.*—During the past year all target practice reports of National Guard organizations received by the War Department have been reviewed in this office and comments thereon submitted to the Chief of Militia Bureau. This policy has been very beneficial in that it enables the Chief of Coast Artillery to have more complete information concerning the performance of a greater amount of Coast Artillery materiel, it makes available additional information in reference to the details of training regulations in order to correct any deficiencies that may be found, and it permits a comparison being made between the various units in the Army of the United States.

It is contemplated during the coming year to publish more complete details of the results of the National Guard target practice than has been done in the past.

(2) *Organized Reserves, Reserve Officers' Training Corps, and Citizens' Military Training Camps.*—All officers charged with supervising target practices held by these components during the past year have been required to furnish detailed target practice reports thereof. The advantages of this are similar to those enumerated for the National Guard.

(3) Assistance has been given by this office to the tactical training of other components where practicable. For example, problems, drawn up at the Coast Artillery School, were furnished the Commanding General, III Corps Area, on which were based the field training of a National Guard antiaircraft regiment; qualified Coast Artillery officers were designated as umpires.

Such problems, and those used during the preceding year at Camp Upton, N. Y., have a wide influence in the service in raising the standard of training. It is expected that they will form the basis for effective mobilization training.

(4) The R. O. T. C. units inspected all showed a very satisfactory condition in training and spirit though facilities vary greatly. School authorities are generally interested and favorable to military training. . . .

g. Training Texts.

(1) *Regulations.*—The status of training regulations is as follows:

Printed or mimeographed	52
Being written or revised	12
In hands of The Adjutant General awaiting approval	3
Approved, awaiting printing	3
	70

The reduction in the total from the 78 reported upon last year is due to a policy of consolidating texts where this may logically be done. Further consolidation will result from revisions now under way. By this means much repetition is avoided and also the frequent necessity, while studying one text, for referring to others.

(2) All instructional texts pertaining to submarine mines are being completely revised and rewritten.

(3) A member of the Training Section, this office, has been detailed for part time duty in the Office, Assistant Chief of Staff, G-3, in connection with the preparation of field manuals. He supervises also the work of the Coast Artillery School in the preparation of branch manuals. It is believed the training literature of the branch will be simplified and can be reduced when these manuals are completed.

(4) *Correspondence Courses.*

Completed and approved	10
Under preparation or revision	6
To be prepared	3
Total	19

Much favorable comment has been received from Reserve Officers as to the correspondence courses recently issued, and there is no doubt that this system of instruction has proved its value.

h. Organization Tables.

A large number of organization tables have been revised during the past year to secure uniformity and to present in better form the actual organization of the several units. The status is as follows:

Printed and distributed: 25 Peace; 42 War.

Awaiting approval: 8.

Awaiting revision of equipment tables: 6 Peace; 15 War.

4. MATERIEL.

* * * * *

e. The equipment for terrestrial sound ranging has been under development with the assistance of the Signal Corps. It has been given a service test during the last year and found satisfactory. It is expected that it will be adopted as standard within a short time.

f. The antiaircraft tests that have been held at Aberdeen Proving Ground, Md., during the past two years, through the close cooperation of the Ordnance Department, the Corps of Engineers, the Signal Corps, and the Air Corps, have resulted in surprising progress in antiaircraft fire control for guns. New equipment has been developed that so far exceeds the efficiency of the war-time materiel now in service as to require immediate action to secure rearmament of antiaircraft gun units. Funds have been appropriated for the F. Y. 1929 to initiate this rearmament program. Fire control for machine guns beyond tracer ranges is still in an experimental stage; various experimental devices which promise to solve this problem will be tested at Aberdeen Proving Ground this fall.

g. A comparatively inexpensive type of emplacement for 155-mm. guns has been designed and given a satisfactory service test in Panama. It allows the trails to be moved quickly and this gives the gun 180 degrees or, if desired, 360 degrees of field of fire. As the gun has only a limited traverse on its carriage, this type of emplacement adds considerably to its usefulness against rapidly moving targets.

h. The personnel of the 52d Coast Artillery (Ry) have devised a system of ammunition service from car to gun enabling loading to be continuous throughout a wide traverse of the piece. As a result, the falling off in rate of fire noted in Par. 3 *b* for the calendar year 1927 has been corrected and an improvement will be recorded for the present year.

* * * * *

5. Conclusions.

a. In technical training the condition of the Corps is satisfactory in all branches.

b. In tactical training there has been a marked advance during the past year. This should be continued by the allotment of the necessary funds for troop movements. It is very desirable that the minor joint exercises be extended by outlining, at least, the mobile coast defense forces for sectors of the coast line adjoining the harbor defenses at which these exercises are held, and that sufficient aircraft be made available to develop the Air Corps' mission in coast defense.

c. The progress of development work toward standardization of equipment has been gratifying.

*"The frontier army post, serving to protect the settlers from the Indians, has acted as a wedge to open the Indian country and has been a nucleus for settlement. In this connection mention should also be made of the government military and exploring expeditions in determining the lines of settlement. * * * The growth of nationalism and the evolution of American political institutions were dependent on the advance of the frontier. * * * After King Philip's War, while Albany was still in the fur-trading stage, the New England frontier towns were military agricultural outposts against the Indian enemy. * * * The Army of the United States pushed back the Indian, rectangular territories were were carved into checkerboard states, creations of the federal government. The later frontiersman leaned on the strong arm of natonal power."* Turner, F. J., The Frontier in American History. pp. 16-17, 24, 44, 218.

Mechanization—Aloft and Alow

By Major C. C. Benson, Cavalry

A roar from the exhaust of a 400-horsepower motor, a blast of track-driven sand, and a new war machine charges away to show what it can do across country. It bounds into the air at the edge of a stream and lands on the far bank going at forty miles an hour. With the throttle wide open, the machine heads for a steep sandy hill and skyrockets over the crest with two feet of daylight showing beneath the hull. "Hull" is used advisedly, for this machine will float, and can no doubt be taught to swim. Presently the machine returns and the driver borrows a pair of goggles—says he can't see through the sand storm when he steps on the gas. The demonstration continues, with figure eights at speed that would shame an international polo pony, and some road work in which a Packard straight-eight gets second money. The performance of Mr. Christie's new wildcat will convince the most conservative observer that Mechanization is picking up.

Mechanization in the military sense implies the use of mobile machines in combat. Aircraft, tanks, and armored cars are outstanding examples of fighting machines used during the World War. We are all more or less familiar with the subsequent rapid development of aircraft and the many uses made of planes in commercial service as well as in the Army. The popular demand for airplanes has reached a point where the continuous development of machines and the training of pilots are assured. We are now beginning to think about mechanization as applied to the ground forces of our Army.

Last summer the Experimental Mechanized Force at Fort Leonard Wood raised the curtain on this phase of the program. Because the force lacked fast tanks that could travel under their own power, it was really motorized rather than mechanized. It did serve, however, to try out plans that have been matured recently in the War Department. The series of exercises took place during July, August, and September; they required the combined efforts of about eleven hundred men of various Regular Army Units.

In organization, as in everything else, this force was experimental. It included Light Tanks, Heavy Tanks, Infantry, Field Artillery, Engineers, Antiaircraft Artillery, Signal Corps, Chemical Warfare Service, Armored Cars from the Cavalry, an Ammunition Train, a Medical Corps detachment, and Motor Repair units. For certain exercises, Air Corps units were attached. Three months of close association and cooperation brought out a variety of ideas on the organization of a Mechanized Force. There were many hot discussions—lieutenants, captains, majors, and colonels—we all contributed our views, and occasionally listened to the opinions of others. Those friendly discussions

Note: By special arragement with the editors, this article appears in the January issues of several publications other than the Coast Artillery Journal.

still continue, for no one—not even the War Department—has as yet come out with an Approved Solution. Serious study of Mechanized Force organization is one of the most obvious beneficial effects of the summer's work.

All units of the miniature E. M. F. army were completely motorized or mechanized. Motorized units had only transportation; mechanized units had transportation plus fighting machines. Some of the motor equipment was ten years old; some was brand new. There were trucks with well-worn solid tires, and trucks that enjoyed the luxury of oversized balloon pneumatics. Cross-country cars and motorcycles covered an equally wide range—some had gone 100,000 miles and others were painfully new. Altogether there were about thirty different makes of old and new commercial vehicles represented in the line-up. Few of us had realized that truck manufacturers are now turning out machines that can travel at high speed. On good roads even the big fellows with seven and eight-ton loads can step up to forty miles an hour. In so far as commercial equipment will meet the needs of mechanized units, there will be no difficulty in finding plenty of fast sturdy machines.

E. M. F. training covered three main subdivisions—unit training, marches, and tactical exercises. Individuals from all units had received some training in work with motor equipment before joining the E. M. F., but there was constant need for greater knowledge and experience. The men went at their work with enthusiasm and displayed great interest in mastering the details of their machines. When reassignments were necessary, it required a direct order from the C. O. to pry a driver loose from "his" machine. Unit training soon reached the point where road marches were possible. Sections composed of about fifty vehicles made some preliminary marches of forty to sixty miles; then the whole force made several marches—90 miles, 140 miles, 420 miles. Between marches, units commanders conducted the tactical training of their respective organizations. Combined tactical training began on August 28 and continued at the rate of two or three exercises each week for over a month. These maneuvers enabled unit commanders to demonstrate the capabilities of their organizations and brought officers of the various branches into close contact. Each of the exercises focussed attention on problems that called for original solutions—without benefit of precedent. Instead of merely complying with well established regulations, the E. M. F. officers were trying to create something new. Needless to say, the training was the most interesting that they have experienced in the past ten years.

What we did last summer is important only for its effect upon the future. Future plans should begin with clean-cut answers to the usual questions—"What is the purpose of a Mechanized Force?" "How will its establishment affect other branches?" All branches of the Army must adjust themselves to the introduction of this new weapon; and all officers who are directly concerned with developing an efficient Mechanized Force must crystalize their ideas on these questions. In the absence of authoritative opinion, I submit the following: The purpose of a Mechanized Force is to provide army and higher commanders with an additional powerful weapon, which will combine fire power, shock,

and speed, to a much higher degree than now exists in any one combatant arm. Specifically, units of a Mechanized Force could be used to great advantage for advance, flank, and rear guards; to seize and hold temporarily distant key positions or critical areas; to cover tactical or strategical concentrations; for raids, wide envelopments, turning movements, exploitation, and pursuit. Forests, mountains, and swamps present insuperable obstacles to the operations of a Mechanized Force; consequently, it cannot supplant the Infantry or Cavalry.

Whatever the size of any mechanized unit that may be authorized, it should be well balanced and highly mobile. Tanks that require railway transportation have no proper place in such a force. Similarly, slow cumbersome artillery should be excluded. Air forces, other than the necessary observation and command planes, need not form an integral part of the mechanized force. For a particular operation, Army or G. H. Q. could attach any or all of these powerful weapons, but to include them in the normal organization of a mechanized force would kill its mobility.

Light artillery in a mechanized unit should be effective against either ground or air targets. Otherwise, the force will be encumbered with single-purpose weapons, such as are now standard in Field Artillery and Antiaircraft Artillery units, with the additional burden of many non-combatant vehicles. Every exercise conducted by the E. M. F. showed the vulnerability of a force that is diluted with a surplus of transportation. When the force deploys for action, the non-combatant vehicles become "led horses." Their destruction would cripple the force; hence it is necessary to use combat elements for their protection. The solution is to eliminate non-combatant vehicles, and concentrate on fighting machines. The present 75-mm. antiaircraft gun, if suitably mounted on a fast tank chassis, would serve admirably the light artillery needs of a Mechanized Force.

With these preliminaries out of the way, we may as well proceed to organize—on paper—a mechanized combat team such as might be assigned to a detached corps or to an army. For convenience, we shall call this unit a Mechanized Brigade.

Fast Tanks—One regiment of three battalions. A total of

> 130 fighting tanks, each armed with gas or smoke device, 3 or 6-pounder cannon, and .30-caliber machine gun.

Mechanized Artillery—One regiment.

> 8 howitzers (105-mm.) on fast tank chassis.
>
> 16 guns (75-mm.) on fast tank chassis, for use against either ground or air targets.
>
> 4 searchlights for antiaircraft work, on fast tank chassis.
>
> 8 mortars (4.2 C. W. S.) on fast tank chassis.
>
> Command tanks for battery and higher commanders.

Mechanized Infantry—One battalion.

> 48 machine guns; 48 automatic rifles; 16 anti-tank cannon.
>
> Carried on fast tank chassis.
>
> Command tanks for company and higher commanders.

Special Troops—

- Headquarters—one company.
- Armored Cars—one company.
- Airplanes—one observation squadron, plus necessary command planes.
- Antiaircraft—one battery, armed with .50-caliber machine guns in quadruple mounts.
- Engineers—one company.
- Signal—one company.
- Medical—one company.
- Band—one.

G-4 Units—

- Repair and Salvage (for both machines and weapons)—one company.
- Supply Train—one company.

At least one Mechanized Brigade is necessary to test the soundness of organization, to test new equipment, and to develop methods of training. For effective training, two brigades are needed to permit the development of offensive tactics in mechanized warfare. Then there should be the necessary technical and tactical schools; research, engineering, procurement, and supply establishments; and a suitable administrative organization. Without half trying, we evolve a new branch of the Army.

Perhaps there is no need of creating a separate branch. The Cavalry or Infantry might adopt the newcomer. Cavalry and the Mechanized Force will have much in common tactically; and between them they could cover practically any kind of terrain. The Cavalry would gain in fire power, shock, and mobility by utilizing fast cross-country vehicles for transport and combat. Significant items in the last annual report of the Chief of Cavalry indicate that the Cavalry is fully alive to the advantages of partial mechanization. However, horses and hardware require quite different handling, and the Cavalry is interested primarily in horses. The Infantry, which has had control of the Tanks for the past eight years, is building up an excellent Tank School organization. If the Mechanized Force is organized as an offshoot of the Infantry, exisiting facilities can be expanded to meet the demands for trained personnel. However, since the Infantry absorbed the Tank Corps a marked change has occurred. Modern tanks are not the blind lumbering monsters of ten years ago; increased mobility has prepared them for cooperation with many branches—particularly with the Cavalry and the Air Corps. In other words, the tank is no longer an exclusively Infantry weapon. A larger sphere of action is opening up for fast tanks, and for any mechanized units that may be built around them. To imbed these highly mobile units in slow-moving masses of Infantry would be wasteful. We cannot expect Infantrymen or Cavalrymen to specialize on mechanization in addition to their other duties; and yet without specialization of a higher order, mechanization will land in the ditch.

If the Mechanized Force is to develop its full powers, it must depart from old methods. It must break away from traditions which were fixed before the advent of fast powerful fighting machines, and seek new ways to apply the

old principles. Before it can win a place as a worthy member of the combat team, it must develop new methods which are better than the old. An organization to be useful for this purpose should be one that is committed entirely to the future.

One solution of the problem is to resurrect the Tank Corps. Tanks have been the nucleus for experiment and will undoubtedly form the backbone of the Mechanized Force. The fast tank chassis will be the most important single item of equipment, because it will be utilized not only by the Mechanized Force, but also by many other branches. As it will necessarly be a special vehicle (non-commercial), it should receive special consideration from the men who will handle it in time of war. There will be many other necessary items of equipment which must fit together in the operations of a Mechanized Force and in coordinated mechanization plans for the whole Army. In addition, there should be continuous experiment and development work on heavy tanks for the Infantry, tanks and reconnaissance cars for the Cavalry, cross-country cargo carriers, and motor vehicles of various types for all branches. A single responsible agency to execute War Department policies on these matters is needed. That agency, if we may judge from war records, might well be the Tank Corps.

No matter who sits in the driver's seat, mechanization will entail considerable expense. Fighting machines are costly. However, when we were face to face with long casualty lists in the World War, the American program called for the expenditure of $175,000,000 on tanks alone. To get any tanks at all, we had to beg them from Great Britain and France. Even though our allies gave us their tank plans, we were unable to send a single American-made tank into action. If we have forgotten those lessons, it is time to recall them.

We make no bones about spending hundreds of millions on the peacetime development of air forces. Their "flaming coffins" of World War days have long since joined the scrap heap. Not so with our tanks—the slow-moving ten-year-old machines now in the hands of Regular and National Guard troops would be blown to bits by the modern anti-tank weapons of any first-class power. The modern fast tank can run circles around them. Even with a highly efficient Air Corps, it is probable that in any future war there will still be some fighting on the ground. The ground troops deserve the best fighting machines that money can buy—and plenty of them. In money now or men later, we must pay the price.

Some Notes on 155-mm Gun Firing

By Maj. C. D. Y. Ostrom, C. A. C.

RECENT memoranda publishing instructions concerning fire against naval targets and the results obtained in such practices bring up several questions for discussion. Here only certain phases of this matter will be considered and these with special reference to firings by 155-mm. gun batteries. This gun will be used as our example since we can obtain record of a greater number of practices fired by this weapon with a larger number of rounds fired per practice than for many other types of cannon. To offset the claim that this may not be a good selection from which to draw general conclusions because of the small caliber and reputed accuracy of the gun, one must bear in mind that the carriage was not designed for fire against a moving target, the conditions of emplacement, and the required rate of fire.

The propriety of the equations by which the score is determined will not be discussed, this paper being concerned rather with the values of some of the terms used in the equations as indicated by results obtained in recent target practices.

Several curves have been plotted to indicate certain relations between some of these terms. These can not give definite, clear-cut values. All are so interrelated that they must be considered as a group and then as giving indicative rather than fixed values. These curves are based on data obtained from reports of well over one hundred different practices, fired during four years in all parts of the country and under widely varying conditions. The poorest as well as the best have been considered, all practices coming to hand having been used with few exceptions. No practice fired at a range in excess of 14,000 yards has been considered, as in such a case the increased powder charge must have been used and the results therefore are not comparable. Throughout this article the reader must bear in mind that the firings on which these curves were based have been held in the years 1925 to 1928, inclusive. There has been during this period an annual trend toward increase of range of practices and, especially during the last two years of this period, a decided effort to reduce the elapsed time between rounds. Thus many of the values entered against a range of 10,000 yards or so and most of those plotted against a time of K seconds or less have been determined in these two latest years. For these two years it is believed the state of battery training has been higher, methods of record keeping and analysis have been uniform and more accurate, with the result that values for 1925 and 1926 are not strictly comparable to those for 1927 and 1928. Be that as it may, the differences are not so great as to preclude the comparisons made here. Much of the data from which these curves are constructed may not be published; in any case the space they would occupy would scarcely be justified. For the first

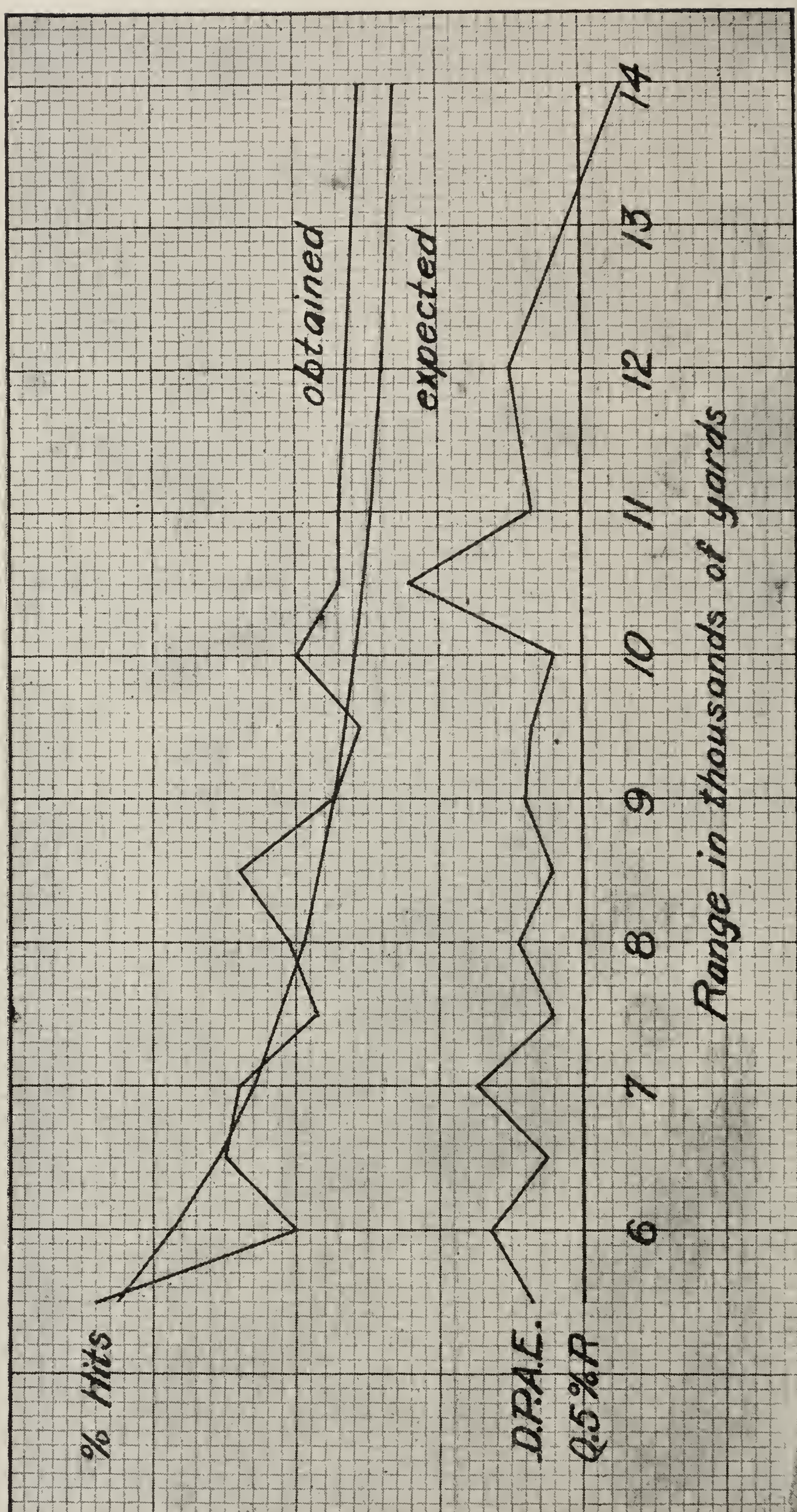

% Hits
obtained
expected
D.P.A.E.
0.5%R
6
7
8
9
10
11
12
13
14
Range in thousands of yards

Fig. 1

reason, scale values have not been indicated on the curves. This but slightly lessens their value as we are interested primarily in comparative values.

Our principal interest is in hitting—without hits a battery is of small value. And of equal importance is the rate of hitting. This is emphasized by being the first component in the scoring equation. In the past year an attempt was made by a change in this component to increase materially the rate of firing in the belief that the rate of hitting would be likewise increased. At the same time a minimum range for firing was announced. Two relationships have been used in the representation of hitting in the curves plotted: per cent of hits obtained and the hits per gun per minute determined.

Per cent hits have been plotted against range in Figure 1. These have presumably all been determined on the present type of destroyer target. Records available for the year 1925 did not yield these data. The jagged line shows obtained values, the curve those to be expected. These latter have been computed on the assumption that the battery DPAE was the mean value of those obtained in the practices studied as brought out later; viz., 57/100 of one per cent of the range. This curve would indicate only that reasonably satisfactory results have been obtained in recent practices.

In the A component of the scoring equation are the terms K and t, K apparently being a term intended to correlate and equalize the effect of the rate of fire of various cannon and mounts, and t the corrected time of practice in seconds. From study of these values, one reaches the conclusion that K seconds is considered the normal value for the average time per round per gun, the T'' of our reports.

In Figure 2 a curve has been plotted showing the relationship between the per cent of hits obtained and the firing interval, another test of battery efficiency. In order to plot a rational curve of these values it was necessary to reduce tabular values to equivalent values at one single range. Obviously a curve of these values in which the per cent of hits obtained at say 6000 yards were averaged with those from practices at 10,000 yards or 14,000 yards or any other range would be without value. To permit comparison, a range of 10,000 yards was selected. The following reduction ratio was used: the per cent hits that would have been obtained had the practice been fired at a mean range of 10,000 yards is to the per cent hits obtained at the actual mean range of the practice as the probability of hitting at 10,000 yards mean range is to the probability of hitting at the actual mean range of the practice. The horizontal line P through this curve represents the per cent of hits to be expected when firing at a range of 10,000 yards with a battery DPAE of 57/100 of one per cent of the range, with a battery height of site of 90 feet, using the hypothetical destroyer target assigned for this gun.

In this same figure, the curve showing hits per gun per minute has been plotted, the wavy line being the plot of values determined in these practices, while the smooth curve indicates the theoretically expected values under the conditions stated in the preceding paragraph. After studying these curves

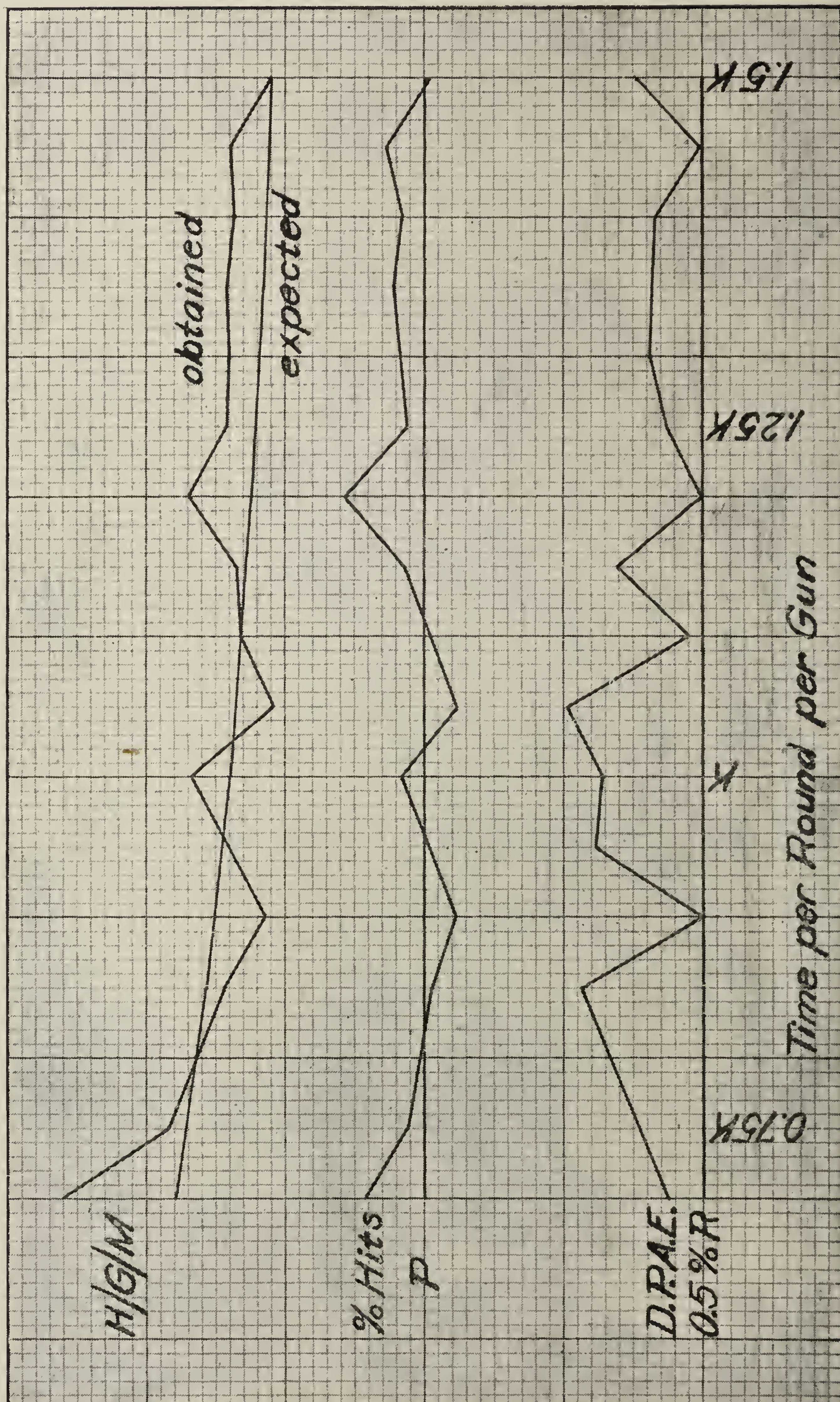

H/G/M
obtained
expected
% Hits
P
D.P.A.E.
0.5%R
0.75K
K
1.25K
1.5K
Time per Round per Gun

FIG. 2

keeping in mind the limited number of practices for each time interval, ranging from two to ten, we may draw the conclusion that at least for such short practices as our allowance of ammunition for target practice permits, the accuracy of fire is about independent of the rate of fire.

No term seems to come up for discussion more than does the DPAE. Remember, this is a *battery* DPAE and not a *gun* DPAE. In the usual case, four guns will contribute to this value. Personnel errors in laying may be, and probably frequently are, included in what is considered the battery DPAE. For the most part in plotting these curves, the value of this developed probable armament error, the DPAE, has been expressed as a percentage of the range. This is a convenient and interesting relationship to use. It eliminates further reference of data to range when plotting and renders unnecessary any reference to firing table values of probable errors with consequent discussion of their propriety. It permits ready comparison of the armament probable errors developed at different ranges. Expressed in these terms, developed armament probable errors may be averaged for any time interval. In Figure 1, values of the battery DPAE have been plotted against mean range. A mean value of

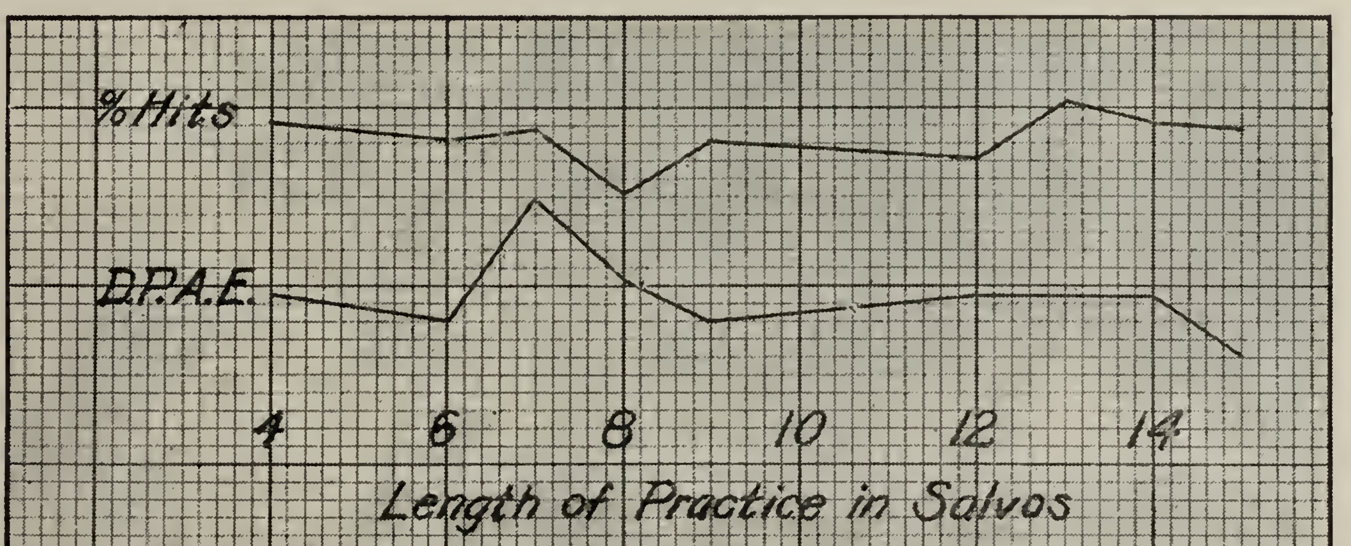


FIG. 3

battery DPAE has been computed from records of practices for each five hundred yards. A recent article in the COAST ARTILLERY JOURNAL recommended that a value for probable error in range be used equal to one-half of one per cent of the range; consequently the horizontal line representing this value has been superimposed on the curve. We may note here that while quite close to the recommended value, the mean of battery DPAE's touches this at but a single point, that point being where the very small number of practices for which data are available renders the mean of doubtful value. It is interesting to note that the mean value developed from this curve for the battery DPAE is 57/100 of one per cent of the range. The probable error of all values was determined to be 12/100 of one per cent of the range, so that the battery commander may expect in half of his practices to develop a range probable armament error lying between 45/100 and 69/100 of one per cent of the range, lacking any better information relative to his battery.

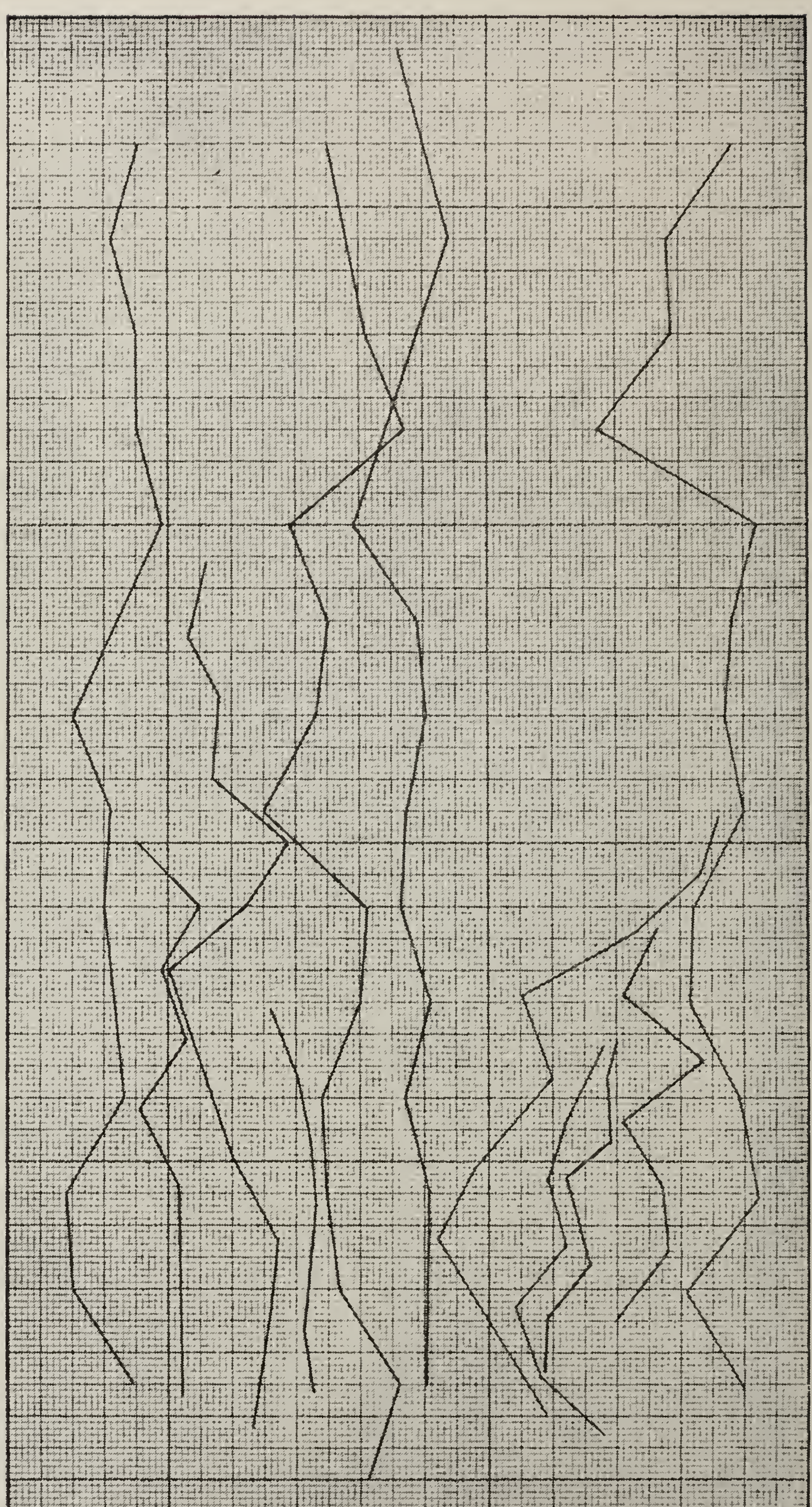


Fig. 4

In Figure 2 are plotted battery DPAE's expressed in terms of percentage of range against average time per round per gun in multiples of K. Inspection indicates that the value of the DPAE has not been greatly affected by shortening the firing interval, though more uniform results seem to have been obtained with slower firing. Study of the data from which the curve was constructed indicates that the values corresponding to those near 0.75 K should be as readily expected as those plotted against the larger values of K. An interval of 1.5 K seconds between rounds is quite deliberate firing and no increase in accuracy should be expected from slower firing as this time interval affords ample opportunity for the careful setting of firing data and for a complete check of the laying.

In studying the equation from which the score is determined we find that the value of the battery DPAE enters directly into the numerators of the B and C components and indirectly (through P) into the denominator of the first part of the A component, in all cases entering into these components in such manner that the larger the DPAE, the larger will be the computed value of the component. The only factor in the score tending to cause the battery commander to reduce his DPAE is the denominator of the B component and the effect of this seems but slight. The limited number of complete records at hand indicate that the absolute value of the DPAE has little effect on this B component, as the DPAE and mean dispersion are interdependent and this term is in fact a measure of battery calibration, as is intended. One may say that the desire to obtain hits will cause the battery commander to attempt a low battery DPAE. However, under the present score, the battery commander can so control the time factor as largely to neutralize the effect of few hits; with a single hit in a practice and a time factor of 0.75 K, he can get a score for his practice that will be rated excellent. So he will make a greater attempt to control the position of the center of impact without great desire to reduce the DPAE. What, then, is going to cause the battery commander to concentrate on the development of a small battery DPAE, certainly a matter of prime importance?

In the score, better assign a certain value to the factor that is to represent probability of hitting, be it a firing-table probable error or be it expressed in terms of a certain percentage of the range. I prefer the latter and recommend that a value of six-tenths of one per cent of the actual mean range be assigned as the value of probable error to be used in computing score. This is a convenient figure to use and is sufficiently close to the value determined from the records of the previous practices considered. The battery commander should expect to develop this in at least half of his practices. But, even though it is not used in the score computations, let us by all means continue to compute the value of the battery DPAE as at present and let some small percentage of the total score or rating value be based on the obtaining of a small value for the battery DPAE in each practice.

Figure 3 might be termed a representation of battery fatigue. Here both the per cent of hits obtained and the battery DPAE in terms of per cent of range have been plotted against the length of the practice in salvos. Reference is made to pages 127-158 of C. A. M. No. 8 of 1928 on which the curve of black circles—"centers of impact if no corrections nor personnel errors had been made"—give additional information. A representative group of these has been replotted to a common scale of time and range deviations and is reproduced here as Figure 4. This figure contains graphs of practices varying from seven to fifteen salvos in length and from about fifteen to thirty seconds firing interval. Individually, they indicate the state of training of the battery; collectively, they confirm the statement made above that our target practices are not of sufficient length to give us any information as to the effect of the rate of fire on battery fatigue, another measure of battery accuracy.

Recently these guns have been fired with satisfactory results using Case III against moving targets in several practices with a fifteen seconds or less average time per round per gun. With further slight modifications of the service of the piece and using Case II, it should be possible to reduce this appreciably. If this rate of fire is to be expected for the future, the carriage should be modified. This carriage was designed for fire against fixed land targets and at present is unsuitable for use against any sort of moving target, let alone such a rapidly moving one as should be its normal objective. Desirable modifications would include the removal of the sight and traversing mechanism from the vicinity of the quadrant sight and elevating mechanism. This would greatly facilitate both the laying and checking of data and should certainly result in more rapid and more accurate fire, reducing the firing interval and the battery DPAE at the same time to give more hits per gun per minute.

"Insurance of life and property, by preventing the loss thereof, is worth all the 'premiums' expended in that prevention." Professor Charles S. Spooner, President of the Vermont Peace Society, quoted in Richard Stockton, Peace Insurance, p. 31.

Colonial Coast Forts on the South Atlantic

North Carolina, South Carolina, Georgia, and Florida

THE vast expanse of territory extending southward from Virginia was once claimed by the English under the name of Virginia, by the French under the name of New France, and by the Spanish under the name of Florida. That was in the time "When all a man sail'd by, or saw, was his own," and the various claims arose from the discoveries of individuals who "sail'd by or saw" portions of this territory. The original Spanish claim to the whole continent, based upon Papal grant following the discoveries of Columbus, was rejected by other nations, and all subsequent claims were based upon direct explorations or upon actual occupation.

Sailing under a commission granted by Henry VII, of England, Sebastian Cabot explored the coasts of America in 1499, sailing from Newfoundland to Albemarle Sound or a little beyond. He made no landing near the southern limit of his voyage, and England made no immediate effort to exploit his discoveries; but it is upon his explorations that England's claim to the South Atlantic region was based.

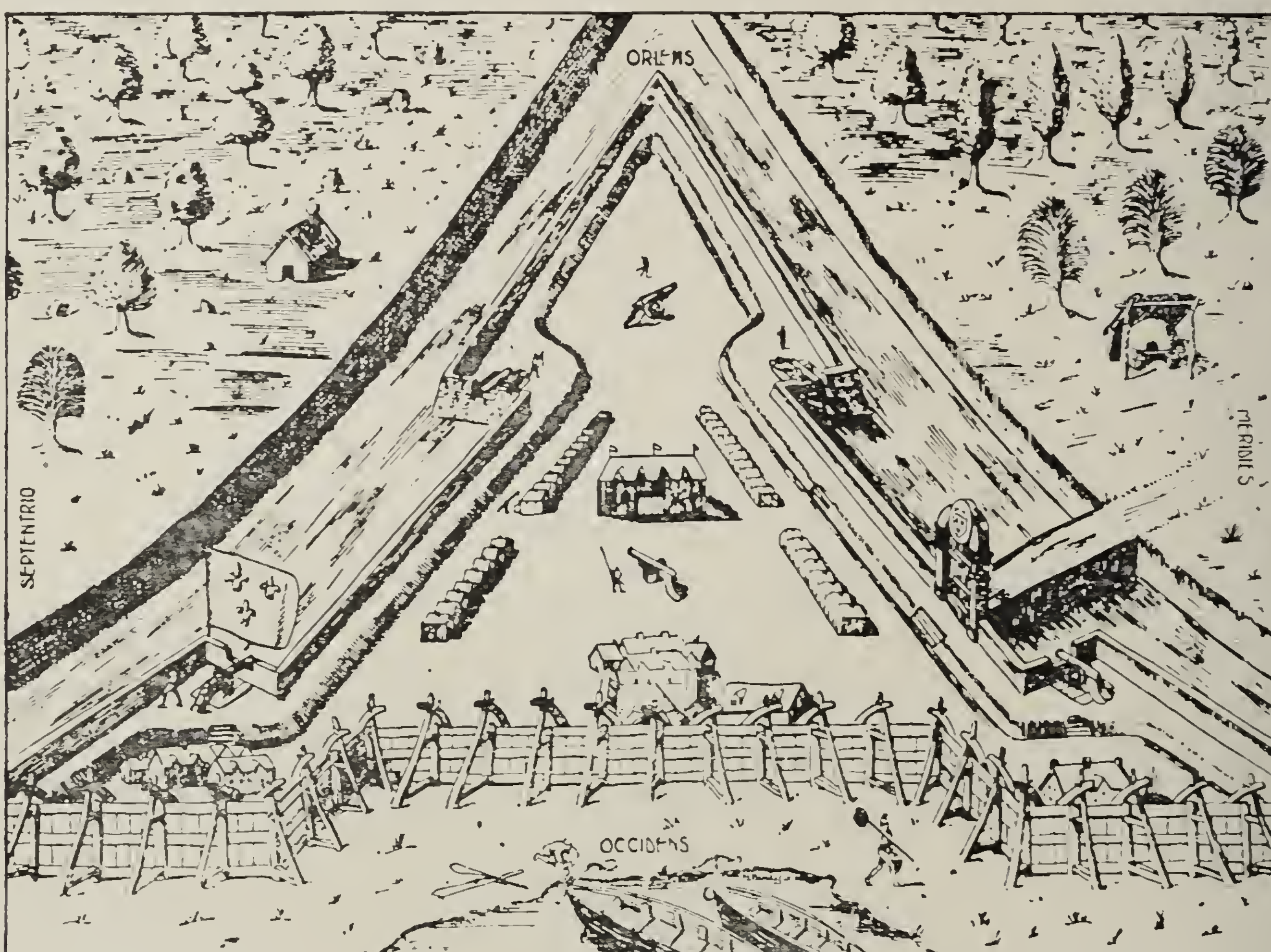
In the year 1512, Juan Ponce de Leon, an old visionary and former governor of Porto Rico, discovered and named Florida. Landing in the vicinity of the site of St. Augustine, he explored the country but did not go beyond the limits of the present state. In 1518 Lucas Vasquez de Ayllon followed the coasts of Florida, Georgia, and South Carolina to the mouth of the Combahee River, where he decoyed a number of Indians on board his vessel to be carried off and sold into slavery. De Leon in 1521 and De Ayllon in 1524 made second voyages to Florida, but both were forced by the indians to leave the country.

In the latter year, Giovanni de Verrazano, a Florentine employed by Francis I, of France, reached land in the vicinity of Wilmington, North Carolina. By coasting along the Atlantic shores and trading with the natives, he set up a French claim to the continent from Newfoundland down to the twenty-fifth parallel of north latitude.

These conflicting and overlapping claims could be settled only by actual occupation, and France took the first step to secure this valuable and fertile region. Civil war raged in France between the Huguenots, or French Protestants, and the Catholics. The Huguenots were the weaker party in number, but they had a powerful friend in Admiral Coligny, who conceived the idea of providing a place of refuge beyond the Atlantic for his Protestant brethren. Obtaining a commission from Charles IX for that purpose, he sent out an expedition of two ships under Captain Jean Ribault.

This commander reached land in the vicinity of St. Augustine in April, 1562, and then coasted northward to the mouth of a river which, from the

"fairness and largeness of its harbor," he named Port Royal. Landing his colonists "on the south eastern point of Parris Island, open to the ocean, upon a small creek," not far from the present site of Beaufort, Ribault established his settlement and built a fort which he named Fort Charles, in honor of the king. This, the first coast fort built within the territorial limits of the United States, was "in length but a sixteen fathom, and thirteen in breadth, with flanks according to the proportions thereof." Upon its completion, twenty-five or thirty men were designated as a garrison, and in June, Ribault set sail for France, bidding his colonists to "be kind to each other; let each love God and his neighbor; let no jealousies grow nor disputes make you live apart, but cultivate brotherly love and you will prosper."



From Avery's *History of the United States and Its People* by permission of C. W. Burrows and A. W. Henn

FORT CAROLINE

They might, perhaps, have prospered more had Ribault cautioned them to cultivate grain and vegetables, for he was unable to send them provisions; and when their supplies became exhausted they became a shiftless burden upon the bounty of their Indian neighbors, who were so friendly that they even helped to rebuild the fort when it was accidentally consumed by fire. Jealousies crept in and mutiny and murder followed; supplies failed and famine threatened. Discontented and disheartened, the colonists built, as best they could, an inadequate vessel, and set out upon the hazardous journey to France.

Undaunted by his first failure, Coligny sent out a second expedition, in 1564, under the command of René de Laundonnière, who had accompanied Ribault on the first voyage. Arriving safely at Cape François in June, Laudonnière explored the coast and decided to plant his colony on the River of May (St.

John's), in Florida. Here, on the northern bank of the river, he erected his fort, which he named Fort Caroline. This work was a triangular structure with walls built of fagots, sand, and turf. The western, or landward, side was fronted by a small ditch, and was "raised with terraces, made in the form of a battlement, nine foot high;" the river side was enclosed with "a palisade of planks of timber, after the manner that gabions are made;" and the south side comprised a bastion in which the ammunition was kept.

Laudonnière, repeating the error made at Fort Charles, neglected to cultivate the soil. The Indians became hostile, provision failed, and the men became mutinous. At this critical time, the English free-booter, Sir John Hawkins, arrived and shared his supplies with the colonists, and in August, 1565, Ribault arrived with immigrants, supplies, seeds, implements, and animals.

Spanish jealousy and bigotry were now aroused, and Philip II appointed Pedro Menendez de Avilez governor of Florida with a view to expelling the French from the soil and of establishing a Spanish colony in the vicinity. Menendez started with an expedition of thirty-six vessels, carrying twenty-six hundred soldiers, sailors, priests, mechanics, laborers, women, and children; and on August 28, 1565, the same day that Ribault reached his colony, the Spanish landed fifty miles further south. After reaching and naming the harbor of St. Augustine, Menendez sailed northward until he sighted the French vessels anchored off Fort Caroline. The French, not trusting the Spaniards, slipped their cables and put to sea with the enemy in hot pursuit. The Spanish, unable to overtake Ribault's forces, returned to St. Augustine and laid the foundation of this fortress, the first permanent settlement in America.

Upon learning that the Spaniards were fortifying themselves, Ribault left a small detachment at Fort Caroline and set out to attack St. Augustine. He anticipated an absence of about two days, but a sudden and violent tempest drove his fleet down the coast and wrecked every vessel. Menendez saw his opportunity and, not knowing that Ribault had been wrecked, hastened overland to destroy Fort Caroline before the French could return. With five hundred men, he attacked in a driving rain at dawn. The weak garrison was caught entirely unawares and was easily and quickly overpowered. The occupants of the fort, with the exception of a few who escaped to the small boats in the harbor and of some of the women and children, were put to the sword. Menendez then hung a sign in one of the tree, bearing the inscription: "*No por Francesses, sino por Luteranos.*" He changed the name of the fort to San Mateo, repaired it, and garrisoned it with three hundred men under Gonzales de Villareal.

Fearing the possible return of Ribault to St. Augustine, Menendez hurried back to that post, where he learned of the loss of the French fleet. Sending out detachments along the coast, he ultimately captured and killed Ribault and most of his command. About two hundred of the Frenchmen reached the coast near Carnaveral, about an eight-day march from St. Augustine, where they were engaged in building a small fort and constructing a vessel when the

Spaniards appeared in force. The French fled to the shelter of the woods, but subsequently about three-quarters of them surrendered and were, so it is said, treated kindly. The fort was demolished, the vessel burned, and the cannon spiked. The Spanish themselves then built and garrisoned near here a small fort which they named San Lucia.

Having expelled the French, Menendez turned his attention to the improvement of his own position. Satisfied with his location at St. Augustine, he constructed a log fort to cover both the landward and seaward approaches. This fort, named Fort San Juan de Piños, comprised a palisade of pine trees, without a ditch. The platforms were made of pine trees laid horizontally and filled in with earth. The works were never fully finished and were not capable of offering much resistance against a strong force.

The next step was an exploration of the coast and the establishment of outposts. Fort San Mateo was strengthened, and two other works, opposite each other, were erected nearer the mouth of the St. John's River. At St. Helena, at Avista, and on Amelia Island, Menendez left men to erect forts, and at each of the Indian towns visited by him he insisted on the construction of forts. Receiving reinforcements from Cuba, he built and garrisoned small forts south of St. Augustine at Carlos and Tequesta, near Cape Florida, and at Tocobayo, near Cape Carnaveral. In the eighteen months following his arrival, Menendez had expelled the French, had carefully explored the coast from St. Helena to Cape Florida, and had built and garrisoned forts at St. Augustine, San Mateo, Avista, Amelia Island, and St. Helena, and block-houses at Carlos, Tequesta, Tocobayo, and San Lucia. San Mateo and St. Helena were more or less regularly occupied, but the other outlying forts were gradually abandoned.

Laudonnière, with some eighteen or twenty men, had escaped from Fort Caroline, and ultimately reached France. There the news of the massacre raised a furore among Catholics and Huguenots alike, but the weak Charles IX took no steps to avenge the outrage. So Dominique de Gourges, a soldier who had suffered as a Spanish galley-slave, resolved to seek revenge. Fitting out two galleys and a tender, he set sail for Florida in 1567 with less than two hundred men. Receiving a salute from the guns of Fort San Mateo as he passed, De Gourges proceeded to Fernandina Harbor, near the mouth of the St. Mary's River, where he assembled a thousand Indians to assist in the attack on the Spanish. The two forts at the mouth of the St. John's were quickly carried by assault and the garrisons put to death. Fort San Mateo, however, presented some difficulty until the garrison ventured an unwise sally, whereupon the fort was captured and the men killed. As Menendez had done three years before, De Gourges set up a pine plank with the inscription: "Not as to Spaniards, but as to traitors, thieves, and murderers." Then, in May, 1568, he demolished the forts and returned to France. Fort San Mateo was, shortly afterward, again reoccupied by the Spanish.

While on a free-booting expedition in 1586, Francis Drake landed a piece of artillery and fired two shots at Fort San Juan. The Spanish garrison, supposing the whole English force was about to advance, fled into St. Augustine. Drake, thus encouraged to attack, led his men against the town. After making some slight show of resistance, the soldiers and the inhabitants retreated to San Mateo, leaving the town and the fort in the possession of Drake's men. After pillaging and burning the town, the English departed, whereupon the Spanish governor returned and commenced at once to rebuild St. Augustine. At that time the combined garrisons of Forts San Mateo and San Juan numbered only about four hundred men.

Further to the north English explorations had continued and efforts at colonization had begun. For many years England had neglected to press her claim to possessions in America, but a few enthusiasts were beginning to see the value of permanent establishments in the New World. Among the early promoters of emigration to America was Sir Walter Raleigh, who, undismayed by the disastrous failure of his half-brother, Sir Humphrey Gilbert, in Newfoundland, obtained a charter from Queen Elizabeth to found a colony in Virginia.

In 1585 his expedition of one hundred and eight colonists sailed under the command of the famous admiral, Sir Richard Grenville. The seven vessels of the fleet reached Roanoke Island in the summer, and there the colonists landed under the leadership of Ralph Lane. In establishing his settlement, Governor Lane built Fort Raleigh on the northern end of the island. Within a year, the failure of supplies and the enmity of the Indians so threatened the existence of the colony that Lane seized upon the chance arrival of Francis Drake in June, 1586, and abandoned his settlement. A relief ship arrived at Roanoke Island a little later and, to protect the interests of England, left fifteen men with supplies for two years.

Undeterred by his first failure, Raleigh sent out a new expedition of one hundred men, women, and children in 1587 under John White as governor. Destined for Chesapeake Bay, the expedition stopped at Roanoke in July to look for the men left by Grenville the year before, but a ruined fort and whitening bones were all they found.

Governor White decided to reoccupy Roanoke Island rather than to go on to the Chesapeake. After six weeks spent in establishing the colony and preparing its defenses, White left his family and returned to England in the interests of his colony. Unavoidably prevented from returning at once, it was August, 1590, before he revisited the site of the settlement. Upon his arrival he found the fort deserted and the colonists gone. Unable to locate his family and his colony, White returned to England; and the "Lost Colony" became one of the unsolved mysteries of the age.

Not until sixty years had gone by did this territory return to the pages of history. The land remained unsettled until 1653, when Roger Greene and some

of his Presbyterian associates, coming from Virginia, settled upon the banks of the Chowan River, near Edenton. Governor Johnston (1732-1754) says that "The Province of North Carolina was first settled by People from Virginia in low circumstances who moved hither for the benefit of a larger and better range for their stocks." Other dissenters followed in small groups until there was a considerable settlement around Albemarle Sound. In 1663 this area was organized by Governor Berkeley as the Albemarle County Colony under William Drummond as Governor.

In March of this same year, Edward, Earl of Clarendon, and seven associates obtained from Charles II a grant to all the lands lying between the thirty-first and thirty-sixth degrees of north latitude (later extended from 29° to 36°30′). In 1665 the Clarendon County Colony was organized at the mouth of the Cape Fear River under Sir John Yeamans.

In January, 1670, the Carolina proprietors sent three ships with emigrants under William Sayle to plant a colony below Cape Fear. They landed on Beaufort Island but, believing that the banks of Ashley River afforded better "pasturage and tillage," they removed in 1671 to the "first highlands of the Ashley river," a few miles above the present site of Charleston, on the site of Old Town. About eight years later they abandoned the spot; and upon Oyster Point, at the confluence of the Ashley and Cooper Rivers, they finally established their settlement.

The first settlers on the site of Charleston had reached there in 1670, and, in September, "we build our towne upon a point of land called Albemarle point seated upon the River that leads in from the sea called by us Ashley river where we are afortifieing ourselves" to such advantage that the community "In a little while will be so fortified as not to feare any attaque." By November the guns were mounted and the town "well fortified soe as not to feare all the Spaniards can doe."

For a good many years East Florida had led a comparatively peaceful existence. The settlement of the South Atlantic coast by the English naturally produced a certain amount of friction between Florida and Carolina, but the effect was not felt at St. Augustine until 1665. In that year Captain John Davis, an English buccaneer, made a descent upon St. Augustine with seven vessels and pillaged the town. At this time the Spanish settlement was protected by a totally inadequate octagonal fort with two round towers. The attack led the Spaniards to commence the erection of a substantial fort, the Fort Marion of today, on which work was continued more or less steadily until 1756, in which year it was declared completed. The new structure, named Fort San Marco, was a castle of soft stone, which mounted fifty pieces of artillery.

The people of Albemarle, distant from Florida and busily engaged in subduing the wilderness and guarding against the Indians, paid little attention to the European wars and less to the activities of the Spanish in Florida. Further south, however, the colonists felt the need of coast defenses, for they were con-

Forts, ly harrassed and alarmed by the Spaniards and their Indian allies. In is the "About the 18th of August last we received newes that the Spaniard wth appthe Indians about S^{te} Augustine & the Spanish Keyes was come to a River about 6 miles from vs & vpon the recepcon of the Larum havinge continuall notice for 7 or 8 days before of their cominge wee had putt our selves in reasonable good Posture to defend ourselves ag^{t} an Enemy the Indians informeth vs that there was about 200 Spaniards & 300 Indians & one as we conceived to be A ffryer & thanke God for itt . . . the Carolina ffriggott came in allmost to the mouth of the River . . . & wthin 2 dayes they wthdrew their Camp & Marched hoame."

The early forts deteriorated rapidly, as early forts seemed to have had a habit of doing, so in 1675 "The Grand Council having this day advised upon the erecting of a new fortification about Charles Towne," Captain Stephen Bull was engaged to lay out the new lines. By 1695 Charleston again required fortifications, and a Committee appointed by the House to "Consult and advise about the forme and maner of ffortifying of Charles Towne" found "by a nice Scruteny into the matter" that it would cost "one Thousand pounds at Least to make a Regular and Defencive ffortification at the End of the Broad Streete at the place Called Southells ffort." Accordingly, a bill taxing imported liquors and exported "Skinns and ffurrs" was introduced and passed for "appropriateing the Publick money Raised and to be Raised for Building a ffortification at Southells ffort."

The building of Southell's fort led to a desire for further defensive works, so, late in 1696, a Committee, appointed "to Survey and Consider whether there be not A more Convenient place or places for fortifieing in Charles Towne, Than the place appoynted by act of Assembly," reported "that they wth: a Committee of y^{e} Upper House Did Survey and have Considered of the most Convenient place And it was y^{e} oppinion of the Majo^{r} part of the Committee, That the poynt of Sand to the northward of the Creeke commonly Called Collins his Creeke, is the Most Convenient place for fortifieing." Thus it was that, by 1700, Charleston had "a strong Fort, and regular Fortifications made to defend the Town."

In 1702, soon after the beginning of Queen Anne's War, Governor Moore of South Carolina urged an expedition against the Spaniards at Fort San Marco which was not at that time in a very defensible condition. Desirous of striking the first blow, he hastily assembled twelve hundred men, half of them Indians. Moore himself took four hundred soldiers to St. Augustine by sea, sending the remainder with all the Indians by land. The land forces, under Colonel Daniel, arrived in advance of the naval forces, and attacked and plundered the town. When Moore arrived the English invested the fort but were unable to take San Marco because the expedition lacked heavy artillery. Colonel Daniel was sent to Jamaica to procure some guns, but before his return, two Spanish vessels arrived at St. Augustine from Havana. Moore, becoming alarmed concerning

his situation, hastily raised the siege, which he had continued for three m and abandoned his stores, armament, and munitions.

In 1706, while the war between England and France and Spain still r in Europe, Governor Johnson was informed of a projected invasion of Sout Carolina by the Spaniards. He immediately strengthened the existing fortifications and built Fort Johnson, a small structure on James's Island, in which he mounted a number of guns. Hardly had this been done when five French vessels, carrying nearly a thousand French and Spanish troops, appeared off Charleston. The attacking force ascended the river and cast anchor just above Sullivan's Island, and about eight hundred troops landed and ravaged the country. The outraged people seized their arms and soon drove the invaders back to their vessels, after killing or capturing about three hundred men. Unable to force the surrender of the defenses, the fleet at last withdrew.

All this time North Carolina had been markedly indifferent to the necessity for coast defenses, but in 1712 a fort was ordered built on Core Sound, principally to overawe the Indians. This fort was named in honor of Governor Pollock.

Claiming that the Altamaha River fell within the boundaries of South Carolina, and desiring to secure the river and to control its navigation, King George I ordered Governor Nicholson to erect a fort at some suitable point. With a company of one hundred men, Nicholson selected a site at the confluence of the Oconee and Ocmulgee Rivers and constructed a fort which he named Fort George. The Spanish ambassador, arguing that the fort was built within Spanish territory, demanded that it be demolished, but no immediate action was taken. Shortly afterwards the fort was destroyed by fire and was insubstantially rebuilt at the expense of the colony, but within a few years the post was abandoned.

In 1720 it was reported that the "fort at Beauford is so much out of repair and the great gun carriages so rotten that the same is defenceless and of no service, whereby the families have no place of security in time of alarm." To satisfy the inhabitants, nine new gun carriages were ordered, but the fort received no repairs except such as may have been made by the people residing in the vicinity.

The scheme of government attempted by the Lords Proprietor of Carolina proved to be a failure, and their titles and interest in the Colony were sold to Parliament in 1729. At that time Carolina was considered to extend from the St. John's River on the south to Albemarle Sound on the north. This expanse of territory was deemed too extensive to be efficiently controlled by one government, so it was divided into the two territories of North and South Carolina, with the southern boundary of South Carolina set at the Savannah River. All the territory south of the Savannah was held in reserve by the Crown.

Robert Johnson arrived at Charleston early in 1731 as royal governor of the Province, and he brought with him seventy-four pieces of artillery sent to the colony by the king. The governor had been instructed to "build two good

Forts, one at *Port-Royal,* and the other upon the River Altamaha, betwixt which is the River Savanna." He set out promptly to "mark out the Land," and the appropriation act for 1731 contained an item of five thousand six hundred pounds "To his Majesty by loan for building a fort at Altamaha and a fort and barracks on Port Royal river," and another item of fifteen hundred pounds "survey balance due Alexander Pams." Additional money was appropriated in 1733 and 1734.

The lands to the south of the Savannah River were still unorganized and unsettled. James Oglethorpe, following a detail on a Commission to investigate the condition of jails in England, conceived the idea of a colony between the Savannah and Altamaha Rivers for the relief of the poor and indigent people of Great Britain. A charter was obtained in 1732 by a corporation, called the Trustees for establishing the Colony of Georgia, to which were granted all lands between the Savannah and Altamaha. In November, Oglethorpe embarked with one hundred and sixteen men, reaching Savannah in February, 1733. A small fort was at once erected on the banks of the river, and some guns were mounted for the defense of the new colony. In March, Oglethorpe wrote, "Our crane, our battery of cannon, and magazine are finished."

Since it provided a buffer between Carolina and the Spaniards in Florida, the new colony received a warm welcome from Charleston, particularly when it became evident that Oglethorpe was to be very active in the construction of coast and frontier fortifications. While the Spanish had made no attempt to establish settlements north of the St. John's River, they still laid claim to much of the territory lying within the grant to Georgia. Oglethorpe clearly saw the possibilities of conflict, and as soon as he had settled his colonists at Savannah, he made treaties with the Indians and then began the erection of fortifications.

After a personal reconnaissance of the shores and frontiers of Georgia, the governor commenced work on his defensive plans. The most important of his works was Fort Frederica, so-named after Frederick, Prince of Wales. In February, 1736, two hundred persons landed on St. Simon's Island to establish the settlement of Frederica, and by March they had a battery mounted and the fort almost completed. The main portion of the work was built of tapia (tappy or tabby), a concrete made of lime mixed with stones and sea shells. In shape, the fort formed a half-hexagon, with two bastions and two demi-bastions and towers at the point of each bastion. The curtains of earth faced with timber varied from ten to thirteen feet in height. A ravelin mounting 18-pounders faced the river, two bastions faced the landward side, and a wet moat surrounded the fort. The permanent garrison consisted of one officer, one sergeant, and three men. In the direction of the ocean, just beyond the parade ground and hidden from view from the sea, was a battery of twelve heavy guns commanding the entrance to the harbor.

On the south end of the island, seven miles from Frederica, was a small community called St. Simon's. Near it Oglethorpe built a small battery which became known as Fort St. Simon's. To control fully the entrance to Jekyl Sound,

another work was erected opposite St. Simon's on the northern end of Jekyl Island, where a brewery was established to make beer for the troops.

South of Jekyl Island, and fifty miles distant from Frederica, was Cumberland Island. On the northern side of the island Oglethorpe directed the construction of Fort St. Andrew, which had walls of wood, filled with earth and surrounded by a palisaded ditch. On the southern end of the island, Fort William was built to command the entrance to Amelia Sound.

As the most southern outpost of Georgia, Fort St. George was built on Point St. George at the mouth of St. John's River and on the site of the old fort. The detachments manning this fort were, however, withdrawn in 1739.

Other minor works and frontier forts were built in the colony. In 1735 a number of Highlanders founded New Inverness on the Altamaha, sixteen miles above St. Simon's Island, and built a fort mounting four pieces of artillery. A year later, a fort, also mounting four cannon, was built at Darien, ten miles from Frederica. Wormsloe, on the Isle of Hope, had a tapia fort built by Captain Noble Jones. Fort Wymberly was a wooden fort built by Captain Jones to command the inland passage between the Vernon and Wilmington Rivers, a route much used by slave-running and plundering parties of Spanish, Indians, and outlaws. For the defense of Skidoway Narrows, a timber fort called Jones's Fort was erected on Skidoway Island and garrisoned by a detachment from Captain Jones's company until 1738.

For the protection against hostile approach by way of St. Augustine Creek, a small fort was erected at Thunderbolt, but it was falling into decay as early as 1737. Fort Argyle was built at a narrow passage on the Great Ogeeche River, where the Indians were accustomed to cross on their forays into Carolina. Fort Barrington was on the Altamaha River. At Yamacraw, on the Savannah, a small fort was erected as a place of refuge. A fort was put up on the site of Augusta as a protection against the Indians.

The Spanish, uneasy because of Oglethorpe's activities, sent commissioners from St. Augustine to protest against these preparations and to demand the immediate evacuation of the whole of Georgia and of all South Carolina below Port Royal. Oglethorpe, of course, refused compliance, and the Spanish threatened him with war. Don Manuel de Montiano, governor of the Spanish settlements, had been improving his own situation. Upon his arrival in 1735 he had found St. Augustine without adequate defenses, Fort San Marco being dilapidated and its armament unserviceable. According to his own report in 1737: "The fort of this place is its only defense; it has no casemates for the shelter of the men, nor covert ways, nor ravelins to the curtains, nor other exterior works, that could give time for a long defense; but it is thus naked outside, as it is without a soul within, for there are no cannon that could be fired twenty-four hours." So he repaired and extended the defenses, heightened the ramparts, built a covered way, installed casemates and bomb-proofs, constructed redoubts, and threw up intrenchments about the entire city. A fort built on the northern end of Anastasia Island covered the entrance to the

harbor. For a garrison, there were about a thousand troops, including infantry, cavalry and artillery.

Oglethorpe found by 1739 that "The Forts I built were run to ruin, being mostly of earth, having no means to repair them," so, when war was declared in November between England and Spain, he felt, as had Sir Walter Raleigh, that the best way to occupy the Spaniard was to keep him busy in his own territory. With assistance from South Carolina and from the Indians in the vicinity, and with a naval force of four twenty-gun ships, he organized an expedition against St. Augustine. In May, 1740, he entered Florida with a force of more than two thousand English and Indians. His first conquest was Fort Diego, twenty miles from St. Augustine. Then Fort Moosa, within two miles of the city, surrendered; but when he appeared before the town and its fort and demanded a surrender, he was met with a defiant refusal.

Installing two heavy, two medium, and thirty light guns on Anastasia Island, Oglethorpe opened fire on the city and the fort with but indifferent success. So far as the fort was concerned, he found that "there are fifty pieces of cannon in the castle, several of which are of brass, from twelve to forty-eight pounds. It has four bastions. The walls are of stone and casemated. The internal square is sixty yards. The ditch is forty feet wide and twelve feet deep, six of which are sometimes filled with water. The counterscarp is faced with stone. They have lately made a covered way by embanking four thousand posts. The town is fortified with an intrenchment, salient angles, and redoubts, which inclose about half a mile in length and a quarter of a mile in width."

The small size of his guns precluded the possibility of making much of an impression upon the fortifications, and his small naval force was unable to enforce a strict blockade of the port. Supplies in sufficient quantity continued to reach the beleaguered garrison, so the occupants of the fort remained quietly within its walls and suffered no particular hardship. Becoming irritable, Oglethorpe alienated the Indians, who began to leave him; the Spaniards surprised and captured the outpost at Fort Moosa; sickness appeared in the British camp; and finally the English troops began to desert. Learning of the approach of some Spanish vessels, the governor became discouraged and abandoned the siege in July.

The ire of the Spaniards was aroused, and they, in turn, prepared to invade Georgia. In June, 1742, a large fleet, bearing about five thousand men appeared off the coast. Besides his forts, Oglethorpe had an armed schooner of fourteen guns, several armed sloops, and a force of about six hundred and fifty soldiers, Highlanders, indented servants, and Indians.

On June 21, a demonstration by about a dozen Spanish vessels at the mouth of St. Mary's River was repulsed by the guns of Fort William, on Cumberland Island, assisted by the armed schooner, whereupon the Spaniards put in at Cumberland Sound. The governor then removed the men and guns from Fort St. Andrew and used them to reinforce Fort William, bringing them in two small boats through the Spanish squadron, "nor lost a single man."

On July 5, favored by a strong easterly wind, a squadron of thirty-six vessels, including one ship-of-the-line of twenty-four guns, two ships of twenty guns, two large scows of fourteen guns, four schooners, four sloops, and twenty-three half galleys, entered St. Simon's Harbor. For four hours the 18-pounders of the fort and the 4-pounders of the water battery engaged the fleet, and at the end of this time the vessels passed on up the river. After a council of war, St. Simon's was abandoned, the guns spiked, and the garrison withdrawn to the northern end of the island to defend Fort Frederica in the attack which was to come. The Spanish then took possession of the unmanned and dismantled fort.

De Montiano prudently brought his fleet to anchor some four miles below the fort and landed his troops to attack from the landward side. The narrow road which Oglethorpe had constructed lay between an impassable morass and an almost impenetrable wood. The Spanish troops were therefore easily held, and a detachment of about three hundred was badly cut up in an ambuscade. Finding that he was unable to reach Fort Frederica by land, De Montiano proceeded, with his galleys, against the town from the sea, but when his boats came within range of the fort, they were met by so heavy a fire that they were forced to withdraw.

On July 18, twenty-eight vessels appeared off Fort William, and fifteen entered the harbor to demand the surrender of the garrison. Ensign Alexander Stuart dramatically replied that neither would he yield the fort nor could they take it. The ensuing engagement lasted for three hours, at the end of which time the fleet drew off with two galleys disabled by the few 18-pounders which had been at Stuart's disposal.

In the meantime, Oglethorpe tried to accomplish by strategy what he could not accomplish by force. By allowing a false message to be intercepted, he led the Spanish commander to believe that heavy reinforcements were at hand and expected hourly. De Montiano hastily embarked his troops and set out for St. Augustine, chased out of the Sound by an enemy that dared not attack him.

In the short time he had been in the country, Governor Oglethorpe had firmly established his colony, with Savannah as its commercial center and Frederica as a strong southern outpost. He had pushed the boundaries of Georgia to the St. John's River, and had set up a strong barrier between Florida and South Carolina. As a result, the Carolinians began to neglect their coast defenses. As early as 1734, it was stated that Charleston had no fortifications capable of much resistance, for the works which had been built in that harbor had been much battered by violent storms besides having undergone the usual deterioration at the hands of time.

During the time Georgia and Florida were conducting their own little private war, the shores of the Carolinas were visited by Spanish cruisers. Attention was thus brought sharply to the undefended condition of the ravaged coasts, and from 1744 on for a number of years considerable thought was devoted, parti-

cularly in North Carolina, to coast defense. The Assembly at Newbern in 1744 discussed the erection of a fort at the mouth of Cape Fear River, on the site of Smithville. In 1745 it considered that "There is great Reason to fear that such Parts of the Province which are situated most commodious for Shipping to enter may be invaded by the Enemy," and appropriated money for their first attempt at coast defense in the erection of a Cape Fear fort large enough to contain twenty cannon. This fort was built and named Fort Johnston, but a subsequent scandal charged Governor Johnston with applying the funds to other uses and with hiring but two or three negroes to throw up a small parapet.

In 1747 "several small Sloops and Barcalonjos" from St. Augustine plundered the coasts at Ocracoke, Core Sound, Bear Inlet, and Cape Fear, and entered Cape Fear River and ravaged its shores. A large appropriation was thereupon made for the erection of forts at Ocracoke, Topsail, and Bear Inlets, and for repairing Fort Johnston. Some work was done at Topsail Inlet and a fort named Fort Granville was put up at Ocracoke, about the center of the North Carolina coast line.

Governor Dobbs wrote of the conditions of these works in 1756, that "upon my entring into this Province, I found . . . they had only raised one small square fort [Johnston] with 4. little bastions and a Fosse, the ramparts and Parapets of a Sandy earth faced with upright pines which were all rotten, in which they had only 6. or 7. small ship iron guns all honey-combed, 3. or 4. of which were 2. pounders and the rest 4. pounders and no garrison but 2. or 3. men to keep the fort and this was all the safety in the Province to defend the most navigable river in the Province, the river of Cape Fear. . . .

"The Assembly before I arrived had out of their new Paper Currency appropriated £2000. Currency to repair Fort Johnston on Cape Fear river, and had appropriated £2000. to be added to £2000. before granted to erect a Fort at or near Ocacock Bar, by which all ships must pass who trade to Neuse, Pamlico & Roanoak rivers . . . They had also appropriated £1500. Currency to erect a battery at old Topsail Inlet or Fort Beaufort, to defend that Harbour, there being deep water on the barr—But no step had been taken to erect any of them when I arrived."

He undertook "to finish Fort Johnston at Cape Fear . . . and to cover the Curtain and two Bastions next the river, which commanded the channel, with a wall upon a stone foundation made of cement, which they call here tabby work, composed of broken oyster shells, lime and sand, there being no stone to be had but what comes in ballast in ships—and also to finish the lower Battery on the Counterscarp." The counterscarp of the other curtains and batteries was to be temporarily palisaded. Fort Johnston would then require for its armament fourteen 18-pounders for the lower battery, sixteen 9-pounders to cover the river, and thirty swivel guns for the landward sides.

Dobbs also "Agreed to erect a Battery with two faces on Core Banks at Portsmouth, where one face wou'd play upon all Vessels coming in from the Bar, and the other scour the channel to the Harbour. . . . [Because of

storms] I thought it more prudent to erect a large battery upon Piles, and to raise it 5 feet above the usual spring tides, than to risque the building a Fort, and to build a strong House to defend the Battery." This work, when completed, would require eight 18-pounders covering the bar and twelve 12-pounders on the other side.

At the battery on Bogue Banks, at Fort Beaufort, the "house is already up and covering," and the battery was nearing completion. "It has also two faces, one which commands the entrance from the Bar and the other defends the Harbour." For this work, Governor Dobbs proposed eight 12-pounders to command the bar and six 6-pounders on the other face.

Forts Johnston and Granville were poorly constructed and proved to be of little service. They never had much equipment, and the expected attacks by the French never developed. Fort Granville was never entirely completed and was wholly abandoned by 1763; but Fort Johnston continued to be partially equipped until the end of the royal government, although its tapia work contained such a large proportion of sand that every time a gun was fired, large pieces fell out of the parapet.

Governor Oglethorpe left Georgia in 1743, and Frederica began to disintegrate. With the conclusion of peace the forts were allowed to decay and the troops were finally withdrawn. Upon his arrival in 1754, Governor Reynolds found the fortifications "decayed," and twenty cannon lying dismounted at Fort Frederica, "spoiled for want of care." By 1755 Georgia was almost defenseless, for "there was not a single good fortification in the province." In Savannah eleven old cannon, three and four-pounders without carriages, and twenty-seven swivel guns constituted the entire show of armament.

In compliance with instructions from the Board of Trade, Reynolds drew up an elaborate coast defense project which proposed four coast forts, located respectively at Frederica, Hardwick, Cockspur, and Savannah, to mount—

Pdrs.	*Guns*			*How.*	*Mortars*	*Regulars*	*Militia*	*Indians*
	24-18	*12*	*smaller*	*12-10*	*100-50*			
Frederica .	10	12	20	4	4	300	350	350
Hardwick .	5	6	10	2	2	150	150	150
Cockspur .	6	3	4	2		30	35	35
Savannah .	8	4	10	2	2	150	150	150

The fort at Frederica was to be a half-hexagon, with two bastions and two demi-bastions towards the land, and two demi-bastions towards the sea. At Cockspur (Fort George), the fort was to be triangular, with three demi-bastions, or a quadrangular blockhouse without bastions. The fort at Savannah was to be quadrangular, with four bastions, three on the bluff and one below.

In 1758, Governor Ellis of Georgia reported to the Board of Trade:

"Immediately after our Assembly rose I took a Journey to the South in order to examine into the state of things in that Quarter. On my way I touch'd at the River Ogeeche and saw the Fort that had lately been raised there in consequence

of the Resolutions of the Assembly last year. It is a Quadrangular Figure, each side measuring 100 yards, constructed with thick logs set upright, fourteen feet long, five whereof are sunk in the Earth, and has four little Bastions, pierced for small and great guns that would render it very defenceable. From thence I proceeded to Midway where I found the Inhabitants had inclosed their Church in the same manner, and erected a Battery of eight guns at Sunbury in a very proper situation for defending the River.

"I reached Frederica two days after[d], the ruinous condition of which I could not view without concern. A dreadful Fire, that lately happened there, has destroyed the greatest part of the town. Time has done almost as much for the Fortifications. Never was there a spot better calculated for a place of arms or more capable of being fortified to advantage. It lies on the west side of the Island St. Simon's, and the chief and most southern branch of the great river Alatamaha. The military works were never very large, but compact and extremely defenceable.

"The Sound will conveniently admit of 40 Gun Ships, and those of 500 Tons burthen may come abreast of the Town; but for three Miles below it the River winds in such a manner that an Enemy must in that space be exposed to our Fire without being able to return it. In short it is of the last importance that that place should be kept in constant Repair and properly Garrisoned, as it is apparently and really the key of this and the rest of the King's Provinces to the south, but the wretched condition in which it now is makes it easy to conjecture what would be its fate should Spanish war suddenly break out.

"From hence I went to the Island of Cumberland on the south point whereof stands Fort William, a Post of no less consequence, as is evident from the Defence it made against Twenty Eight Spanish Vessels and a considerable Land Force that Attack'd it unsuccessfully in the year 1742.

"General Oglethorpe has, in my humble opinion displayed a great deal of skill in his choice of such Situation.

"This Fort commands a noble inlet from the Sea,—the entrance of the River St. Mary,—which runs deep into the Country,—and the Inland Passage thro' which the runaway Negroes and other Deserters are obliged to go on their way to St. Augustine.

"The works are of no great extent but admirably contrived to be maintained by a small Garrison, and might be repaired without any great expence."

In Florida, work on Fort San Marco continued intermittently until 1756, when the defenses were declared completed. The fort, covering about an acre of ground, was a regular quadrangle, with four bastions, lying to the north of St. Augustine, directly opposite the entrance to the harbor. A moat, fifty feet in width, entirely surrounded the fort, and admission was gained from the south over a stationary way and a drawbridge. The gate was protected by a barbacon or ravelin. The curtain was about sixty yards in length, and the parapet was about twenty feet high and nine feet thick, casemated for quarters.

At each angle of the fort was a sentry-box, that at the northeastern corner being also a watch-tower, twenty-five feet in height.

The fort was built of coquina, a sea-shell concretion which is so largely used in Florida and which, soft when first quarried, becomes harder as it is exposed to light and air. Over the gateway was an escutcheon, bearing the arms of Spain, with an inscription setting forth that "Don Ferdinand, the VII., being King of Spain, and the Field Marshal Don Alonzo Fernando Hereda, being Governor and Captain General of this place, San Augustin of Florida, and its province, this fort was finished in the year 1756. The works were directed by the Captain Engineer Don Pedro de Brozas y Garay." The usual garrison consisted of three or four hundred regular troops. In 1763, when Spain ceded Florida to England, Fort San Marco became Fort St. Mark's; but when, twenty years later, England traded Florida to Spain for Jamaica, both names seem to have been used.

In 1758 an Act was passed in South Carolina reciting that Fort Frederick had gone to decay and that a new fort had recently been constructed near Beaufort and named Fort Lyttleton. The site of Fort Frederick was not described nor was that of the preceding fort, but it was probably on or near the site chosen for Fort Lyttleton, on the north bank of Port Royal River, a little below the town, where any vessel approaching Beaufort would have to pass under the guns. Fort Lyttleton was a tapia fort with two demi-bastions toward the river and one bastion toward the land, with a ditch surrounding the whole. Sixteen heavy guns were provided but had not been mounted by 1763.

A project for the defense of Charleston had been prepared and work had been begun during the troublesome times at the opening of the latter half of the century. Construction was, however, soon discontinued, and for a time the project lay dormant. Some work was performed later, and by 1763 the town was tolerably well defended. Toward the south and southeast, facing Cooper River, there were seven bastions or batteries, of which three were extensive. These batteries were connected by lines of earthworks with platforms mounting a hundred guns. About two miles below Charleston was Fort Johnson, on James Island, covering the channel at point-blank range. At this time the water battery mounted fifteen 18-pounders and five 9-pounders, but the fort itself was old and not in the best of condition. It had two demi-bastions and an outwork on the water side, all of them having platforms and cannon mounted.

Rumors of the passage of the Stamp Act spread through the American colonies early in 1765, and everywhere aroused bitter and violent opposition. In September a British sloop arrived at Fort Johnson in North Carolina with a shipment of stamps destined for that Colony. Colonels John Ashe and Hugh Waddell assembled their organizations and prevented the landing of the stamps from the sloop.

In February, 1766, two merchant ships arrived at Fort Johnston from Philadelphia with unstamped clearance papers, and were duly seized by the authorities. About five hundred and eighty men assembled under Colonel

Waddell, spiked the guns of the fort to prevent their use, and then forced the release of the two vessels. Similar incidents all over the country forced the repeal of the Stamp Act in 1766.

The differences between Great Britain and her colonies were, however, becoming irreconcilable and war was rapidly approaching. Like most of the colonies, Georgia and the Carolinas took no heed for the future, and not only did they not build new fortifications, but they neglected those which they had. Two or three years before the outbreak of the Revolution, there were scarcely any suitable forts between Chesapeake Bay and Florida.

At Savannah, Fort Halifax, built in 1759 and 1760 of earth faced with timbers, was dilapidated and, with the exception of two of its caponières, was totally unfit for service. Fort Frederica had been without a garrison since 1765 and, although some of its tapia walls remained from the construction work of 1762, the structure was rapidly becoming a complete ruin. Fort George, on Cockspur, with its mud walls faced with palmetto logs, was "almost in ruins, and garrisoned only by an officer and three men." Of Fort William, on Cumberland Island, and the other works previously erected in Georgia, scarce a vestige remained.

In South Carolina, matters were but little better. Fort Johnson, at Charleston, still retained some of its former power, but Fort Lyttleton, at Beaufort, had been neglected and was sadly in need of repair.

In North Carolina, Fort Johnston had a garrison of one captain, one sergeant, one corporal, one gunner, one drummer, and twenty-one men, and had fit for service eleven 18-pounders, sixteen 9-pounders, and seventeen ½-pounders, but the "said Fort was in no state of defence."

Not until the actual outbreak of war was any decisive step taken. The first action resulted from the determination of the popular leaders in South Carolina to take possession of Fort Johnson at Charleston. Colonel Motte was selected in July, 1775, to lead the expedition, but before he could assemble his body of provincials and land them on the island, the British forces dismantled the fort and withdrew to two armed ships in the harbor. Captain Heyward, with a detachment of Charleston artillery, occupied the fort and soon had three guns ready for action. With another party, Colonel Moultrie, before long, had some heavy guns mounted at Haddrell's Point by means of which he drove the British vessels out of the harbor. Forts were then constructed on James' Island, Haddrell's Point, and other places; batteries were raised at Georgetown and elsewhere; Charleston became a garrison; and Fort Moultrie was begun by Colonel Moultrie on Sullivan's Island.

In December, the Council of Safety of South Carolina directed the repair of Fort Lyttleton, and the erection of a fort at Dorchester, on the left bank of the Ashley River. This new fort was a square redoubt about fifty feet from the water, with demi-bastions at each of the four angles. The walls were built of tapia, three or four feet in thickness and seven or eight feet in height. The in-

terior line was about one hundred feet square. The fort mounted a number of small guns.

While these stirring events were occurring in South Carolina, Colonel James Moore and Colonel John Ashe, in North Carolina, assembled a body of provincials for the purpose of capturing Fort Johnston, on the Cape Fear River. The governor, fearing that the guns would be taken by the people, "had thought it advisable for the preservation of His Majesty's Artillery to dismount the Guns in the Fort and to lay them under the protection of the Guns of His Majesty's Ships of War and to withdraw the little remnant of the Garrison the shot and small Stores and to place them in security on board a Vessel." Colonel Ashe therefore, with no great difficulty, captured the fort and set fire to "all the buildings in the fort, which being of wood burnt like tinder."

General Charles Lee arrived at Charleston in June, 1776, to assume command in South Carolina. Disapproving of the plan for the defense of Sullivan's Island on the ground that the fort "could not hold out half an hour" and that "the platform was but a slaughtering stage," he wished to abandon the island, but President Rutledge would not consent. Fort Moultrie was square, with a bastion at each angle, and was built of palmetto logs laid horizontally in two rows about sixteen feet apart. The two rows were joined together at intervals so as to form a series of pens which were filled with sand. Only the southeast and southwest curtains had been finished, but the fort mounted thirty-one guns, including a number of eighteen and thirty-six pounders. About four hundred men under Colonel Moultrie were available as a garrison for the fort.

On the northeastern side of Sullivan's Island Captain de Brahme had erected breastworks mounting two guns, and about seven hundred and eighty men under Colonel Thompson were available for this station. Elsewhere but little work had been accomplished.

Before he could complete his fort, Colonel Moultrie was called upon to meet the enemy. On June 28, 1776, the British fleet under Sir Peter Parker, including two 50-gun ships, four frigates, and a number of smaller craft, advanced to the attack. Colonel Gadsden with his regiment was at Fort Johnson, Colonels Moultrie and Thompson were on Sullivan's Island, and the other troops under Lee were assigned to Haddrell's Point, James' Island, and the shore in front of the town.

Moultrie's fort received the first onslaught of the enemy when the ships *Bristol* and *Experiment*, fifty guns each, the frigates *Active*, *Solebay*, *Siren*, and *Sphinx*, twenty-eight guns each, the sloops *Thunderbomb* and *Ranger*, twenty-eight guns each, and the *Friendship*, twenty-two guns, pushed in and opened the engagement with a broadside. The heavy bombardment from the ships caused little damage to the soft, spongy palmetto logs, while the 13-inch shells from the bomb-vessel, anchored a mile and a half away, fell into the morass within the fort or into the loose sand. The fort, however, with a limited supply of ammunition for its sixty-four guns, fired deliberately and with a precision which told heavily on the enemy.

About noon, the *Sphinx, Active,* and *Siren* attempted to take up a position which would enable them to enfilade the front platforms and to cut off communication between the island and the mainland, but they all grounded on the shoal on which Fort Sumter was later built. The *Active* was abandoned and destroyed by her crew, but the others succeeded in getting off, although they were too much damaged to participate further in the action.

Firing ceased about half past nine o'clock, and at about eleven o'clock the fleet returned to its former anchorage, with the *Bristol* and the *Experiment* both seriously damaged in hull, masts, and rigging. The British casualties exceeded two hundred men, while the Americans lost twelve men killed and twenty-five wounded. Congress gave a vote of thanks to Lee, Moultrie, Thompson, and the officers and men of the command, and "South Carolina, by her president and common voice, spontaneously decreed that the post of Sullivan's Island should, for all future time, be known as Fort Moultrie."

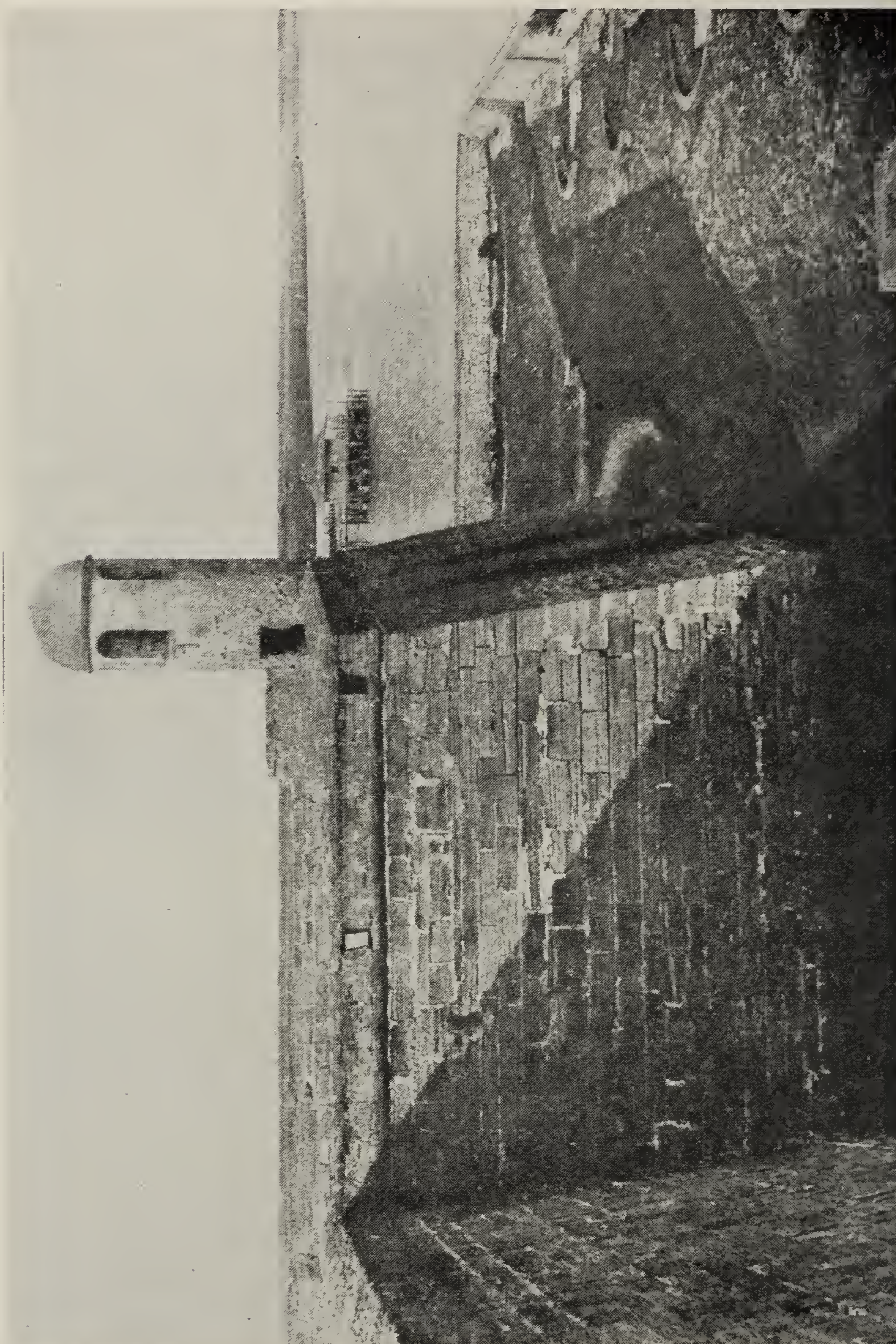
Georgia, in 1776, contemplated the erection of forts at Savannah and at Sunbury on the Altamaha River. Fort Morris was built on a bluff overlooking Midway River, about three hundred and fifty yards due south of Sunbury, in such a position as to cover the direct water approach to the town and also the back river. This fort was a substantial, enclosed earthwork, embracing a parade about one acre in extent. The eastern face, fronting the river was two hundred and seventy-five feet in length, the northern face one hundred and ninety-one feet, the southern face one hundred and forty feet, and the western curtain two hundred and forty-one feet. The guns were mounted without traverses, and a moat surrounded the whole fort. Sunbury had been previously protected when the Midway people, in 1757, in anticipation of an attack by French privateers, "raised a couple of batteries and made carriages for eight small cannon."

In November, 1778, Lieutenant Colonel Fuser, with vessels carrying same five hundred men, attempted to capture Fort Morris from the Americans, but learning that the British troops under Colonel Prevost had withdrawn from the vicinity, he refrained from pushing the attack and returned to the St. John's River, leaving some troops to occupy Frederica and to repair the fortifications. In January, 1779, Prevost returned to Sunbury and occupied the town. Placing batteries in position, he attacked Fort Morris; and Major Lane, unable to hold out, surrendered the fort and twenty-five guns. The name of Fort Morris was then changed to Fort George.

In January, 1779, a force of British troops from Savannah, under Major Gardiner, landed on Port Royal Island. General Moultrie assembled his militia and moved to protect Beaufort. The garrison at Fort Lyttleton failed to await his arrival, but spiked their guns and blew up the fort. This procedure was wholly unnecessary, for Moultrie succeeded in expelling the British from the vicinity of Beaufort. Fort Lyttleton was not reoccupied.

In September, 1779, Count d'Estaing arrived with his fleet from the West Indies to cooperate with General Lincoln in the reduction of Savannah. Pre-

vost, commanding the British army in the south, concentrated his forces for the defense of the city. On the twelfth, D'Estaing landed heavy cannon and about a thousand troops a few miles below the city. Eleven days later Lincoln



From Hammond's *Quaint and Historical Forts of North America* by permission of J. B. Lippincott Company

THE ANCIENT WATCH TOWER OF FORT MARION, ST. AUGUSTINE, FLA.

arrived, and the combined armies commenced the siege. It was soon apparent that the town must be taken by regular approaches, and to that end all energy was directed. A heavy bombardment which continued from the fourth to the ninth of October produced very little effect upon the British entrenchments.

At length D'Estaing became impatient of delay and notified Lincoln that the city must be taken by storm. Before sunrise on the ninth of October, the allies advanced to the assault. At one time it seemed that the works would be carried, but at length the allied forces were repulsed. D'Estaing, unwilling to renew the assault, retired on board the fleet, and Lincoln retreated to Charleston.

In April, 1780, the British again invested Charleston, at which time the city was defended by fourteen hundred men under Lincoln. On this occasion the fleet, under Admiral Arbuthnot, avoided a regular engagement with Fort Moultrie, and, with a favorable wind, ran by the fort, although Colonel Pinckney kept up a heavy fire with his batteries and caused considerable damage to the passing vessels. The successful passage of the forts rendered them of less use than the men who manned them, so the garrisons were withdrawn to the city and the forts were occupied by the enemy. Sir Henry Clinton, commanding the land forces of about five thousand men, disembarked and advanced up the right bank of the Ashley River. A siege was at once begun and prosecuted with vigor. The fortifications were beaten down, and Lincoln, dreading an assault, agreed to capitulate. Charleston was surrendered, and the garrison became prisoners of war. Clinton and Arbuthnot returned to New York, while Lord Cornwallis remained to hold the conquered territory with headquarters at Charleston.

At the close of the year 1781, the British forces in the south were confined to Charleston and Savannah, with Nathaniel Greene in the vicinity of Charleston and Anthony Wayne watching Savannah. Wilmington had been occupied by the British in January, but immediately after the surrender of Cornwallis at Yorktown, St. Clair marched upon Wilmington and the frightened enemy abandoned that post. Major Craig, the British commanding officer, and a few followers leveled the walls of the town and of Fort Johnston, and withdrew to St. John's Island, near Charleston.

On the eleventh of July, 1782, the British evacuated Savannah. General Wayne was appointed to "receive the keys of the city of Savannah" from a committee of British officers. Royal power had ceased in Georgia, but was still exercised in Charleston. That city was evacuated on the fourteenth of December, and on the following day was occupied by the Americans under General Greene. North Carolina, South Carolina, and Georgia had ended their colonial existence and had become states in the new Union, but Florida, like Canada, still remained a British colony.

In the treaty of Paris, signed September 3, 1783, England acknowledged the independence of the United States and surrendered all territory east of the Mississippi River and between the Great Lakes and Florida. This latter colony was restored to Spain. The United States thus became an active power among the nations of the earth.

Spain continued to maintain small forts near the northern boundary line of Florida, but no particular activity occurred until 1812. In that year the Spanish had a small garrison at Fernandina under the command of Captain Jose Lopez. Nine American gunboats entered the harbor under the pretence

of protection of American interests and drew up in a line with their guns bearing on the fort. Lopez, when approached by Colonel Ashley with a demand to surrender, had no alternative. On March 17, he lowered the Spanish flag, and on the following day Lieutenant Ridgeley, of the United States Army, assumed command of the post. Ashley then proceeded to Fort Moosa, a small fort two miles from St. Augustine, and captured it without difficulty. In June, Governor Estrada, of East Florida, sent schooner and two gunboats to attack the fort, whereupon the Americans, who had no artillery, retreated. In 1813, the American forces were withdrawn from this area.

The disputes between the United States and Spain ended in the treaty of Washington, signed in February, 1819, by which Spain ceded to the United States the whole of Florida and the adjacent islands. The name of Fort San Marco was changed to Fort Marion, in honor of General Marion of Revolutionary War fame. The country was created into a Territory in February, 1821, and the sovereignty of the United States was extended to include the whole Atlantic coast line, from the northernmost boundaries of Maine to the southernmost tip of the peninsula of Florida.

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Camouflage for Artillery

By Lieut. A. E. Wilson, C. A. C.

IN a military sense camouflage is work done for the purpose of deceiving the enemy as to the existence, nature, or location of materiel, troops, or military works. It is simply counter-intelligence work designed primarily to defeat or to neutralize the means of intelligence provided the enemy by airplanes, captive balloons, and terrestrial observation. Deception of the enemy is the prime object. Provided the object seems a natural part of its surroundings, concealment is not essential.

There are three ways of gaining this deception: by suppressing all signs of abnormal activity near the object or deceiving the enemy as to the purpose of such activity, by making the object indistinguishable from its surroundings, and by making an object appear to be something else.

Observation is of two kinds, direct or indirect. The former is gained by direct vision, aided perhaps by field glasses or telescopes, from O. P.'s, airplanes, or balloons. The latter, which is by far the more dangerous, is gained by a study of aerial photographs. The camera is a most accurate witness and the skill of an expert photograph reader can hardly be realized.

As applied to artillery camouflage falls naturally under three heads: fixed defenses, railway mounts, and all other mobile artillery.

In the case of the fixed defenses the camoufleur is confronted with a most difficult situation; the large concrete amphitheatre, the smooth, well-kept slopes and numerous walks, all combine to make a position extremely hard to conceal. This can be and is being obviated to a certain extent by allowing the slopes to become overgrown by bushes and long grass, so hiding them from direct observation from the sea. The airplane still remains, and in this case we must depend almost wholly upon paint, as the position is obviously too large to hope to screen. Here the five-color system comes to the aid of the camoufleur. This system is the scientific blending of brown, yellow, cream, green, and mauve, with a narrow border line of black, the latter being used only to stop the line of vision. The mass of the position is apparently broken up into several fragments or masses by the use of ultra-visible colors in conjunction with colors that record no plane and this system also disguises the true character of the visible portions. By the correct selection and application of pigments the plane of the surface upon which they are applied may be made to appear in several different planes. Also the scientific selection of colors will defeat visibility and by chemical preparation of the pigments ray-filters are defeated. The object of this system is to resemble foliage, to compel the eye to record the portions painted green and brown and to fail to record the portions painted cream and mauve. Yellow is used only to counteract shadow. No attempt is made to

blend the colors. Thus the airplane is defeated for the reason that it acquires false information only. Even at very low altitudes the real facts are hidden by the five-color system.

The stereoscopic camera that detects falsely delineated perspective or pigment painted shadow is defeated by the use of opague pigments for near planes and transparent pigments for far planes, by the use of mauve in juxtaposition with its complement, by yellow used to counteract shadow, by a scientific application of the laws of light and color, and by the camouflage of shadow.

The rose filter, which turns all green pigment to rose color and leaves foliage green is defeated by chemically prepared ray-proof pigments which alter the color waves and defy both eye and camera.

In order to break the shadow silhouette of the long gun, metal fins cut in the form of foliage and painted to blend with the color patches on the gun are bound to the gun; these will break the sky line of long guns and carry the eye away from the gun form. Thus, while concealment of permanent positions presents a difficult problem it is by no means insurmountable.

Next we come to the railway mounts. Here again the problem is difficult and complex. The camoufleur has not only the great size of the piece and mount to consider, but the many types of terrain. He must hide not only the gun itself but also the dumps and tracks leading to the position. In hiding the gun and its mount the five-color system again comes to his aid. In fact, so successful is this system that in photographs of railway mounts, taken at only 1200 feet directly over the position, it was not possible to find the guns although they stood on bare ground in an open tract with no covering other than the paint applied on them. Hiding the dumps and tracks is a different problem and must depend on the character of the terrain. It is obvious that a position in wooded or rough country is much more easily concealed than one in flat open country. In the first case it is possible to erect a screen over the work or, better still, any trees cut may be saved and re-erected by artificial means in their original position. The foliage may be replaced by dyed cloth or by fresh brush tied to the trees. Paths may be hidden by brush scattered on the ground though it will be much more effective if elevated on wires to about the height of a man. In any case it must be remembered that the means of concealment must approximate the photographic color displaced and that continuous upkeep is necessary.

With semi-permanent positions, such as the 240-mm., the same care must be taken as is the case with the railway. Since the enemy is going to know very shortly the approximate location of any heavy battery and will cover that locality very carefully to find that position, we must give him something to find. Here the dummy position is most valuable. It must not be obvious or he will pass it up; it must be constructed with just slightly less care, or, you might say, more care, than the actual position as the enemy is to see what you wish him to see and no more. A good camouflage maxim is, "Make your dummies at the same time or before your real positions."

In the camouflaging of positions for lighter mobile artillery, many methods are more or less familiar to all artillerymen. The most common of these methods is the use of the camouflage screen or net. Here we have also the three-color system which, while failing utterly when applied to large masses like the railway mount, is satisfactory for use with the smaller types. This is a use of green, yellow, and cream in small irregular patches separated by heavy black masses also in irregular shapes. The method of treating the problem with this is an endeavor to hide the piece by blending its form and shadow with the landscape. In other words it is an attempt to copy nature who gives so many birds and animals a protective coloring that they may blend with their surroundings. In camouflaging the lighter positions it is doubtful that the artilleryman will have the aid of the camoufleur beyond the furnishing of material. Therefore there are a few essentials which must be remembered: first, so conduct the installing of the battery as not to change the aspect of the locality, or at least make any change so irregular that it will not attract notice; second, avoid straight lines and above all avoid right angles; third, colors which match to the eye do not necessarily match photographically, and it is therefore safer to place the battery in a position where more than one color exists and then hide it under a broken colored covering so that the exact shade of color is unimportant; fourth, material lying flat photographs light while that standing on end is full of shadows and photographs dark; fifth, due to the height from which aerophotos are taken the work must be planned on a scale in proportion to that distance; sixth, keep only enough personnel and material at the position to fire the guns; seventh, maintain camouflage by strict discipline.

It is well to bear in mind that properly conducted camouflage measures conserve men and guns; they also permit undisturbed and therefore effective fire. Too much care can not be given to the choice of a position for on this choice depends the amount of labor and material necessary to carry out the camouflaging effectively. A position having natural cover is of course the best, but often this is not possible and then is when the greatest care must be exercised. However, the seeking of cover must not be carried to extremes, as it would be as safe to leave a battery standing in an open field without camouflage as to put it in the only patch of woods within miles. Overhead cover is not necessary but broken ground is at a premium. Wherever possible positions should be on or near existing roads, as new roads or trails are very hard to hide. On the other hand a crossroad should be avoided as it in itself will draw fire. At times positions will have to be selected in open country; then great care must be exercised. Scatter the guns, be sure that camouflage covering fits the ground lines, and maintain strict discipline. The enemy will not be perfect and may miss you for some time. Or the entire battery may be placed under a single covering, this takes more time and material but has the advantage of all interbattery trails under cover and a certain amount of movement is permissible.

A ploughed field is one of the last places one would expect to find a gun position, yet the Germans had a camp in a ploughed field, one hundred and

twenty yards square, a cover being built for the entire field and sloping very gradually from the center to all sides thus doing away with shadows and giving no indication that it was false.

Where the situation is stabilized one or more alternative positions should be selected and prepared so that when the enemy locates one position a prompt move can be made to another. The nature of the work to be performed by antiaircraft artillery is such that it will need little or no camouflage, for in nearly every case the enemy will devote his attention to the position or work being covered by the antiaircraft guns. However, where positions and lines of defense are being prepared secretly and the presence of antiaircraft gun positions would indicate the proximity of important works they must be concealed.

In summary, the following points should be stressed:

First: Select your position with great care, one with natural material available being preferable whenever possible.

Second: Make a sketch of what you think the position would look like in an aerophoto and so conduct the work that the general aspect is changed as little as possible.

Third: Use existing roads and paths whenever possible.

Fourth: Locate kitchen, latrines, etc., away from the guns.

Fifth: Use natural material to the greatest possible extent, remembering that brush is the best and most important camouflage material.

Sixth: When your camouflage is completed the real work is just beginning for the most important and most difficult task is the maintenance of camouflage discipline.

"Only prejudice or ignorance, or a deliberate desire to attract attention can be responsible for the attitude of a person who claims that our military establishment in time of peace is an expense disproportionate with the wealth of our nation. As long as wars are probable, military forces are a reasonable insurance." Richard Stockton, Jr., Peace Insurance, p. 22.

Morale in Armies

By MAJOR F. A. HAUSE, C. A. C.

MORALE is a word not easy to define in the English language; perhaps the best definition is the following: "A state of mind with reference to confidence, courage, zeal, and the like, especially of a number of persons associated in some enterprise, as troops."

Modern conditions of war are gradually extending the domain of morale and increasing its influence. For, among belligerent nations, war affects a greater number of people and does so with methods of increasing violence. The experience of the war has been a practical demonstration of the fact that morale is as potent a factor in the industrial army as in the military.

All successful commanders have recognized the tremendous value of mental forces in war. History is full of examples. Napoleon said, "In war the moral is to the physical as three is to one." Sherman said, "An army has a soul as well as a man." Foch wrote, "Ninety thousand conquered men retire before ninety thousand conquering men only because they have had enough, because they no longer believe in victory, because they are demoralized at the end of their moral resistance." Marmont wrote of "The mysterious forces which lend momentary power to armies, and which are the key to the reasons why at times one man is equal to ten and at others, ten are worth no more than one." The French drill regulations say, "The moral forces constitute the most powerful factors of success; they give life to all material efforts and dominate a commander's decision with regard to the troops' every act." A prize fighter summarized the same idea in a few words, "A man is licked when he thinks he is."

Morale is the very soul of the soldier. It makes an army as keen in attack, as valiant in defense. It is bold and even enterprising to say to any and every opportunity, "I can," but it does not stop here but adds "I will." Nor does it stop here, because for it the sad chasm between knowing and even willing and doing is completely bridged, so that the man of morale "does it now."

The soldier may be trained what to do in the melee, how to shoot from the hip without aiming, how to stab and withdraw his bayonet, how to club, hit, gouge, and strike for sensitive parts, and all this is a great help; but in a mortal scrimmage of man against man, where each is beyond the control of officers and is thrown upon his own personal resources for initiative—here it is that condition wins and the lack of it means death. Here the soldier fights with all that he ever was or did. Here, other things being anywhere nearly equal, it is the morale that decides. Only high morale, too, can make the fighters good losers. The no less cardinal trait of morale is thus how it takes defeat and retreat, and especially how it bears up under long bombardments or how much shelling can be endured without succumbing to shell-shock. Here the

only salvation is in the alleviation of grim, passive endurance, which only condition can supply, for it alone makes diversion, physical and mental, possible and effective, and it is it also that makes of this long and inactive exposure to danger a method of stealing the will and resolve to fight the harder when the time for it comes.

The factors affecting the morale of troops broadly fall into three classes:

a. Those pertaining to the military service.

b. Those in civilian communities adjacent to the camp or post.

c. Those in the home of the individual man.

The positive factors raise spirits and fighting efficiency; the negative factors undermine and lower them. Therefore, the state of morale is merely the expression of degree of difference between the factors of plus and those of minus.

I have referred to the morale of the individual. The morale of a unit or organization is built up on that of the individuals composing it. The creation of high morale is not a thing easy to accomplish but is a product of careful leadership. It is as sensitive as a delicate flower and may be destroyed by a thoughtless word or an imprudent act. A noted example of a mistaken effort to create a fighting morale in an army is the address of General John Pope to the officers and soldiers of the Army of Virginia on his assumption of command of that army. He said in part:

> I have spent two weeks in learning your whereabouts, your condition, and your wants; in preparing you for active operations, and in placing you in positions from which you can act promptly and to the purpose.
>
> I have come to you from the West, where we have always seen the backs of our enemies—from an army whose business it has been to seek the adversary, and to beat him when found, whose policy has been attack and not defense.
>
> In but one instance has the enemy been able to place our Western armies in a defensive attitude. I presume that I have been called here to pursue the same system, and to lead you against the enemy. It is my purpose to do so, and that speedily.

In modern war, the spirit of troops seems sensitive to outside influence as never before. This is probably due in part to longer periods of waiting and tension. It is also due to better means of communication and higher degree of literacy, whereby the men are better informed as to conditions at home and what is going on about them. Battle conditions are watched and interpreted in the light of experience for the results they may forecast, and as these are favorable or not the morale is correspondingly affected. This spirit is a quality of the human element in war. Its stimulation and control are problems of understanding and management. Curiously enough, while military literature is full of references to the psychological factor in war, they nearly all relate to its abstract importance and throw little, if any light on its practical application to war problems. History shows morale as an essential factor the scientific study of which has in the past been neglected, while its problems have been left to the individual to solve unaided as best he might. The results were naturally variable and imperfect.

The comfortable idea that the old army was good enough is not borne out by facts. No better evidence is needed that something was lacking in the spirit of the old army than the great number of desertions and refusal to reenlist in time of peace, and of the absentees in time of war—the Revolutionary and Civil Wars, for example. It is true that certain results were ultimately achieved. It is also true that better results could have been accomplished in less time and at smaller cost if the full power of mental force had been expended.

A long war is habitually decided by "staying power," which is one of the expressions of morale. As Clemenceau prophesied of the war, "The side that holds out for the last quarter of an hour will win."

Even when a military force or nation is tremendously outclassed by overwhelming superiority, it will put up a sturdy resistance through high morale. The latter adds stupendously to the price an overwhelming enemy of only fair morale must pay for victory. The spirit of the Swiss, quite as much as their armed force, deterred invasion.

The lack of qualities of morale in our best fighting divisions in the early days of the war, their tardy appearance in other divisions, and their absence in still others may be accounted for, in part at least, by the failure on the part of our leaders to realize their importance before the war began. This must not be forgotten in the future so that human lives may not needlessly be lost in the early battles of our next war. The morale of organizations such as divisions and lower units is founded on sympathy among its personnel and between its personnel and its commander. A high state of morale cannot exist without this sympathy. To be sympathetic, a commander need not be weak, for sympathy and firmness are in no way incompatible.

In the World War, defeat was measured not by the miles of territory yielded, but by how the courage and confidence of the troops endured. For more than four years the Germans, according to the map, had won. Their defeat was due to their inability to break the spirit of the defenders of France and Belgium. When they found they could not win, their morale dwindled. By their acceptance of failure and offer of an armistice they set allied victory forward by a year and rendered the use of the preponderating force of the Allies unnecessary. Morale broke before the army was physically crushed—it was merely psychologically beaten. General Ludendorff says: "The results of the further fighting depended mainly on the maintenance of the men's morale."

The Germans had what might be called "materialistic morale" to a high degree as a result of carefully cultivated egotism by which as a people they had come to regard themselves as supermen. They craved power and the material things of life. Posing as exponents of "Kultur," they were apostles of the most sordid materialism the world has ever seen. Faith in the justice of their cause was probably a lesser motive than their code that "might takes right," which also removed all moral obligations in respect to conduct against opponents.

General Pershing, in his report, speaks of two minor French attacks as being "characterized by most careful preparation to insure success in order to

improve the morale of their troops." And of the attack on the Marne salient he said: "But, more important than anything else, it would restore the morale of the Allies and remove the profound depression and fear then existing." Speaking further he says of the Allies: "Discouragement existed not only among the civil population but through their armies as well. Such was the Allied morale that although their superiority on the Western front during the last half of 1916 and during 1917 amounted to twenty per cent, only local attacks could be undertaken and their effect proved wholly insufficient against the German defense."

When the French Government took up the matter of reorganization after the recent war, they gave serious consideration to the study of measures for the avoidance in future of such frightful losses of men as had been sustained, especially by the infantry. Prominent among measures for the purpose given consideration were increases of the heavy fighting arms—artillery, tanks, machine guns, and flyers. This increase in the heavy arms resulted in a corresponding decrease in the lighter arms. The reduction fell wholly on the infantry and cavalry, the argument being that since the infantry suffered the heaviest losses, losses could be reduced if the number of individuals exposed were diminished, the cavalry being considered as of questionable value in future wars.

The infantry was reduced by the reduction of the number of regiments and of individuals bearing rifles, with the provision of more assistance from other arms and placing it more under the protection of other arms, especially the artillery. Thus arose the controversy, "Shall materiel overcome morale," the net result being that discussions and especially those appearing in the military professional press induced the French government to modify some of its enacted and proposed measures on the subject.

In conclusion, I might say that every method known to science is used to perfect military materiel; but materiel is useless without personnel trained in its operation. In turn, personnel in an army is useless unless it be animated by proper spirit. Flaw in morale is more disasterous than defect in materiel. Success may be won by the poorly equipped, but victory never crowns an army disbelieving in itself and without the will to win. Therefore it is as important to arm the mind as it is the body. Materiel things do not win wars. Men win wars—these things merely help them. The quality of the men behind the guns determines how efficiently the guns are served, or even if they are served at all.

Patriotism and love of country are the basis of military morale. It makes no difference whether we are dealing with the soldier, the high command, the nation, or the government, war demands an ever-increasing share of moral forces whose close union and wise combination are alone capable of producing victory.

EDITORIAL

The Journal

THIRTY-EIGHT years ago this month the COAST ARTILLERY JOURNAL made its first appearance as the *Journal of the United States Artillery.* There had long been felt a need in the artillery service of the United States Army for a professional periodical which would afford an opportunity for officers of the Artillery to exchange opinions and to keep in touch with artillery developments —particularly in the fields of fire control and gunnery, which were then, as now, of outstanding interest to artillerymen.

Through the activities of some of the more energetic of the young officers at Fort Monroe in 1891, and with the assistance and approval of the Commandant of the Artillery School, the *Journal of the United States Artillery* made its first appearance in January, 1892. This first Journal was a quarterly of eighty pages, and for a number of years it was highly technical in character, devoting considerable space to fire control, explosives, gunnery, and armor attack. Later, ballistics became a dominating feature, but since the World War tactics, history, and articles of general interest have made the JOURNAL much less technical, although gunnery, fire control, and materiel still have a place in its pages.

Conservation being more or less a military characteristic, the JOURNAL has made few changes in its physical appearance during the past thirty-seven years. As the size of the corps increased, the JOURNAL became first a bi-monthly, and finally a monthly, and it increased the number of pages to its present average of one hundred and twelve. For many years it appeared with a red cover, but the difficulty in securing a satisfactory red at a reasonable price immediately following the last war caused the adoption of the cover with which present readers are familiar. Only once has there been a change in size; the first numbers were $5\frac{3}{4}''$x $8\frac{1}{2}''$ in dimension, but in 1896 the pages were made to measure six by nine inches.

This month the JOURNAL goes back to the red cover—a change which we trust will be welcomed by its readers. The new format is adopted with a certain degree of reluctance, but it is dictated by matters of administration and policy and leads to economies which are necessary and which cannot otherwise be obtained. We hope that the changes will meet with approval. In any case, material on up-to-date topics already secured for forthcoming numbers indicates that there need be no fear concerning the quality of the contents and that the JOURNAL will be able to live up to the old slogan: "Bigger and Better."

PROFESSIONAL NOTES

Coat of Arms for the Harbor Defenses of San Diego

Shield: *Azure,* a pile raguly *or.*

Crest: On a wreath of the colors *or* and *azure* an anchor proper (grayish) behind an eight pointed mullet of rays *or.*

Motto: *Paratus* (Prepared).

The blue shield and the yellow pile are symbolic of the blue ocean and the yellow land of Point Loma. The place was first visited by the Spaniards, Cabrillo in 1542, and the edges of the pile are made raguly (ragged) as the Spanish flag at that time bore a cross.

The crest symbolizes the hardest fought battle of the Mexican War in California, near San Diego, at San Pasquale, December 6, 1846. General Stephen W. Kearny commanded the Americans, consisting of one company of the First Dragoons, a few sailors sent by Commodore Stockton from San Diego, and a volunteer company from San Diego. The anchor commemorates Stockton's sailors, and Kearny's Dragoons wore on their helmets the eight-pointed gold star of rays.

Policies Governing the Selection of Students for the Army War College and the Command and General Staff School, 1929-1930

1. *a.* The number of students that will be detailed to commence a course of instruction at the Command and General Staff School in September, 1929, will be as follows:

Combatant Branches	100
Non-combatant Branches	10
To be selected by the Secretary of War	10
Total	120

Students will be selected—

(1) Normally from officers of field grade who will be less than 50 years of age September 1, 1929;

(2) From captains who on October 1, 1928, were among the first thousand on the promotion list and who on September 1, 1929, will be less than 58 years of age;

(3) From captains below the first thousand on the promotion list on October 1, 1928, who are particularly qualified for higher training and who on September 1, 1929, will be less than 45 years of age. The number of officers selected from this group shall not exceed 10% of the total quota authorized any branch.

b. All officers recommended for the detail must possess those qualifications which will make them suitable for higher command and General Staff Training.

c. If any branch is unable for any reason to furnish its full quota of student officers report of that fact will be made and the shortage apportioned to other branches.

d. In any case in which recommendation is made for the detail of an officer who has completed the course of the School of the Line, the General Staff School, or the Command and General Staff School, the Chief of Branch concerned will submit with such recommendation a brief statement of the reasons therefor.

e. The Air Corps, due to the fact that it has a much smaller percentage of graduates from the Command and General Staff School than any other combatant branch, has been

first awarded 3 of the 100 vacancies allotted to the combatant branches, then the remaining 97 vacancies have been apportioned to all of the combatant branches, including the Air Corps, in the manner prescribed in paragraph II of memorandum to Chiefs of Branches, dated November 1, 1927 (AG 210.63—9-28-27).

f. The apportionment of students to each of the combatant branches will be as follows:

Infantry	39
Cavalry	11
Field Artillery	18
Coast Artillery	12
Engineers	7
Air Corps	10
Signal Corps	3
	100

g. The apportionment of students to each of the non-combatant branches will be as follows:

Adjutant General's Department	1
Quartermaster Corps	3
Judge Advocate General's Department	1
Finance Department	1
Medical Department	2
Ordnance Department	1
Chemical Warfare Service	1
	10

2. *a.* The number of students that will be detailed to commence the course of instruction at the Army War College in September, 1929, will be as follows:

Combatant Branches	55
Non-combatant Branches	10
To be selected by the Secretary of War	10

Students will be selected from officers—

(1) Of field grade;

(2) Normally from those who will be less than 52 years of age on September 1, 1929;

(3) Who are not graduates of the Army War College;

(4) Who have an efficiency rating of at least "excellent";

(5) Who are considered by their respective Chiefs of Branches as possessing those qualifications that would justify their training for higher command and General Staff duty.

b. In exceptional cases only will officers be recommended for the detail whose names are not borne on the General Staff Corps eligible list. When an officer is recommended for the detail whose name does not appear on the list, notation of that fact will be made, together with a statement of the reasons why the detail is recommended.

c. At least 50% of the quota from each Branch will consist of officers who upon graduation from the War College will be available for detail to the War Department General Staff.

d. In considering the qualifications of prospective candidates, Chief's of Branches will take into consideration the increased emphasis now being placed upon the command course.

e. If any Branch is unable for any reason to furnish its full quota of student officers, immediate report of the fact will be made to The Adjutant General.

f. The apportionment of students to each of the combatant branches will be as follows:

Infantry	21
Cavalry	7
Field Artillery	9
Coast Artillery	8
Air Corps	4
Engineers	4
Signal Corps	2
	55

g. The apportionment of students to each of the non-combatant branches will be as follows:

Adjutant General's Department	1
Quartermaster Corps	2
Judge Advocate General's Department	1
Finance Department	1
Medical Department	2
Ordnance Department	2
Chemical Warfare Service	1
	10

h. A list of alternates arranged in order of priority of selection will also be submitted, the number of alternates being equal to at least 50% of the Branch quota.

Extracts from Annual Reports

Actual Strength of the Army on June 30, 1928. The actual strength of the active Army of the United States on June 30, 1928, by classes of personnel, was as follows:

Commissioned officers:	
Regular Army (active list)	11,872
Philippine Scouts (active list)	94
Retired Regular Army, on active duty	133
Retired Philippine Scouts, on active duty	13
Total commissioned officers	12,112
Warrant officers:	
Regular Army (active list)	1,208
Enlisted men:	
Regular Army (active list)	114,757
Philippine Scouts (active list)	6,400
Retired Regular Army, on active duty	28
Total enlisted men	121,185
Grand total	134,505

In addition to all of the foregoing, there were 699 Army nurses (509 regular and 190 reserve), 33 contract surgeons, and 878 United States Military Academy cadets, making altogether 136,115 individuals in the military service of the United States on that date.

Of the 134,505 commissioned officers, warrant officers and enlisted men in the military service on June 30, 1928, a total of 96,366 were serving in the Continental United States, 14,083 in Hawaii, 8605 in the Canal Zone, 310 in Alaska, 1282 in Porto Rico, 11,343 in the Philippine Islands, (including 6486 officers and enlisted men of the Philippine Scouts), 979 in China, 7 in Europe (attached to the Graves Registration Service), and 1530 were either en route from one country to another, on leave of absence, or were serving as military attachés in various foreign countries.

[illegible] *mmissioned personnel.* The following statement shows [illegible] of the 11,966 Regular Army and Philippine Scouts officers in service on June 30, 1928:

Status at date of appointment	*Number in service*
Civil life*	3428
Graduate of United States Military Academy	3544
Enlisted man, Regular Army	1119
Officer, National Army	253
Enlisted man, National Army	275
Officer, Reserve Corps	2184
Enlisted man, Reserve Corps	205
Enlisted man, National Guard	271
Volunteer officer	43
Volunteer enlisted man	16
Officer, National Guard	331
Warrant officer, pay clerk, Army field clerk, or field clerk, Quartermaster Corps	48
Contract surgeon or veterinarian	144
Retired officer restored to active list	16
Retired enlisted man	1
Public Health Service	1
Revenue Cutter Service	1
Coast and Geodetic Survey	2
Flying cadet	68
Officer, Philippine Scouts	16
	11,966

* Includes, in addition to those who had no previous military service, men who have had service during the War with Spain, the World War, or in the Regular Army but who were separated from the service and returned to civil life prior to their present appointment in the Army.

Development of Types of Epuipment

Coat, trench. Upon the recommendation of the Quartermaster Technical Committee there is now under development at the Philadelphia Quartermaster Depot, a garment of the type known as the "trench coat," for use under combat conditions. Samples have been furnished and they are now under consideration by the Infantry, Cavalry, Field Artillery, and Coast Artillery Boards.

Cords, hat, Rayon. A test is now being made of Rayon hat cords as a substitute for the cotton cords now being issued.

Hats, service. In an effort to arrive at a substitute to be used in emergency for the campaign hat, consideration has been given and tests made of numerous types of hats and caps, but so far no satisfactory substitute has been developed. There is now being purchased a number of hats made of domestic fur, which hats will be tested in the near future.

Leggins, canvas, spat type. A test of canvas leggins has recently been completed. The type tested was recommended for adoption for use by all dismounted troops, and that the development of a more satisfactory foot strap be continued. This recommendation was disapproved by The Adjutant General until such time as a more satisfactory foot strap is developed.

Raincoats. A test of the alligator type of raincoats is now under way by the Infantry, Cavalry, and Field Artillery Boards, with a view to its adoption for use in the United States.

Shirt, olive drab (with shoulder loops). Upon the recommendation of the Chief of Cavalry, consideration has been given to the adoption of shoulder loops on the olive drab shirt to prevent the cartridge belt from slipping off the shoulders of mounted troops. It is believed, however, that this difficulty can be overcame to a great extent by lessening the

distance between the keepers on the cartridge belt su[illegible] deferred pending completion of a test of the suspenders [illegible]ated.

Cotton caps. The question of the adoption of a cotton service cap to replace the campaign hat, for troops serving in Panama, is now under consideration.

The Chief of Finance

Claims of the United States Against Germany for Reimbursement of the Cost of Maintenance of the Army of Occupation in Germany

Balance due United States on June 30, 1926		$233,141,247.42
Paid to June 30, 1927, under Article 3, Finance Minister's Agreement of Jan. 14, 1925	$ 8,919,849.17	
Paid to June 30, 1928, under Article 3, Finance Minister's Agreement of Jan. 14, 1925	13,637,866.07	
German Government claim respecting requisitioned coal, credit allowed, Jan. 14, 1928	756.33	22,558,471.57
Balance due United States on June 30, 1928		$210,582,775.85

The Chief of Engineers

Seacoast Fortifications. Operations under seacoast fortifications during the past year have consisted, in general, of the study and preparation of plans for defense projects, the preparation and issue of fire control and other fortification records, the dissemination of data for the movement of railway artillery, the continuation of construction for the emplacement of major-caliber armament in the Panama Canal Zone, the development and test of searchlight equipment, and the maintenance of harbor defenses in the Continental United States and the Insular and Panama Canal Departments.

The studies and preparation of plans for defense projects consisted in collection and coordination of data showing physical characteristics of railroads, in studies in connection with location of guns in the major armament program of certain seacoast areas, and in numerous other studies and plans. Engineer construction included emplacement of 16-inch guns and secondary armament, gun block and connecting spurs for railway artillery, installation of harbor defense searchlights and fire control systems and the construction of wharves, military roads, and trails. The development of antiaircraft searchlights and accessories has progressed satisfactorily. As a result of field tests several minor improvements in the 1925 searchlight have increased its efficiency. During the year a number of searchlight units were purchased and delivered to the service in the Continental United States, Hawaii, and Panama.

The Chief of Ordnance

Experimental and Development Work and Manufacture of New Materiel

Rifles. The development of a pistol-grip stock for the service rifle has culminated in the approval of a type known as the modified type "C", which appears to be satisfactory to all using services. The development of receiver sights has continued, and types are now under test by the Infantry and Cavalry.

Antiaircraft Machine Guns. Considerable investigational work has been devoted to the improvement of the functioning of the caliber .50 antiaircraft machine gun. Other de- velopments have continued actively during the year, notably among these being an im- proved type of buffer.

Antiaircraft Machine-Gun Mounts. A new type of tripod mount, standardized during the preceding year, has been procured in some quantity, in order to supply current needs. A pedestal mount, to carry four caliber .50 antiaircraft machine guns, is being designed and is expected to be placed in production shortly. This design embodies, as nearly as may

be, the changes which tests during the Antiaircraft Exercises at the Aberdeen Proving Ground during the fall of 1927 indicated as desirable.

Army Artillery. The 155-mm. gun carriage 1920, which mounts interchangeably either the 155-mm. gun or the 8-inch howitzer, has been modified as recommended by the Field Artillery Board; it is being retained by the Board for further tests. As a result of service tests, studies of a new unit of this type of materiel will be inaugurated.

Antiaircraft Materiel. Pursuing further the development of the light mobile antiaircraft gun mount laid down by the Caliber Board, a 3-inch antiaircraft gun mount T1 and gun T1 have been designed and manufactured. Tests were conducted at the Aberdeen Proving Ground, as a result of which the gun and mount were approved as standard for manufacture. Three new guns and mounts, designated M1, embodying slight modifications, are under manufacture and will be given further tests.

The instrument trailer T1 which was manufactured last year and tested during the antiaircraft exercises, will be subjected to further tests.

As a result of the satisfactory performance obtained in the firing of the 3-inch antiaircraft gun mount, M 1918, by Case III at the Aberdeen Proving Ground, a number of these mounts in service will be equipped as soon as practicable with Vickers azimuth elevation, fuze-setter receivers, and continuous fuze setters.

Tanks. Design and development work during the year has been limited principally to the medium tank T1, the light chassis T1, and the light tank T1E1, with cargo carrier based on the design of the latter chassis. The pilot chassis was completed early in the year and tested at the Aberdeen Proving Ground. Four light tanks and two cargo carriers (for Infantry and Cavalry) have been manufactured and are now at Fort Leonard Wood for test in connection with the operation of the mechanized force. The new medium tank T1 was completed during the year and tested by the Ordnance Department at the Aberdeen Proving Ground and by the Infantry (Tanks) at Fort Leonard Wood.

Armored Cars. Designs for light and medium armored cars have been completed, and two pilots of the light type and four of the medium type will be manufactured for test in the mechanized force at Fort Leonard Wood.

Fuzes. A mechanical time fuze, for use in the 3-inch antiaircraft gun, has been standardized, and manufacture of this fuze is being inaugurated at the Frankford Arsenal. Two types of combination super-quick and short-delay point detonating fuzes have been tested with very promising results.

Loading of Ammunition. Satisfactory progress has been made in the development and installation at the Picatinny Arsenal of new apparatus for the handling of TNT in the loading of ammunition. A mechanical arrangement has been installed for stirring the liquid TNT during the process of cooling to the temperature at which it is poured into the ammunition. This will supersede the previous expensive and unhealthy method of manual stirring.

Propellants and Explosives. Prior to the fiscal year 1928 a flashless, non-hygroscopic, smokeless powder was approved as standard for service use in the 75-mm. gun, model 1897, and a non-hygroscopic type was approved as standard for the 155-mm. G. P. F. gun, model 1918. During the past year satisfactory flashless, non-hygroscopic powders of similar type have been developed for the 2.95-inch mountain gun, the 75-mm. pack howitzer, and the 105-mm. howitzer.

Research and Ballistics

An instrument for measuring the time of flight of projectiles in connection with the test of fuzes has been constructed, based upon a combination of photo-electric cell and Aberdeen chronograph and the necessary amplifiers. The cell is acted upon by the flash of the gun, followed by the flash of the bursting projectile, this action producing records on the Aberdeen chronograph.

The Chief Signal Officer of the Army

Outstanding Accomplishments of the Signal Corps During the Fiscal Year 1928

In the sphere of fire-control equipment two major developments have been practically completed, namely, the development and construction of test models of a portable time interval apparatus for use in connection with the transmission of firing data for railway guns and other mobile artillery, and the development of an antiaircraft gun battery telephone unit for transmitting data from the readers to the gun crew. Models of these two types of equipment have already been subjected to field tests with the result that the types are about to be adopted as standard.

Another phase of development is that of sound ranging equipment for mobile artillery. Models of improved design have been completed and are now undergoing test by the Coast Artillery and the Field Artillery. This very interesting activity relates to the problem of accurately locating the position of enemy guns and, similarly, the direction of friendly artillery fire upon specified targets through the medium of recorded sound waves.

Permanent Signal Communication Systems

Efforts have been concentrated during the past year toward the placing of all Signal Corps wire and radio communication systems in the best possible operative condition. . . . Similarly, and with a view to the betterment of fire-control communication systems, this office has, during the past year, in cooperation with the Chief of Coast Artillery, extended every possible effort toward the betterment of the general maintenance condition of these systems. Through the provisions of explicit detailed instructions covering a more rigid inspection of fire-control equipment, an effort has been made to see that all equipment is maintained in its highest possible state of efficiency in order that the systems, whether on an active or a caretaking basis, may be ready and in complete serviceable condition in the event of an emergency.

The Chief of Chaplains

The churches are now represented as follows: Baptist, North 9; Baptist, South 5; Baptist, Colored 2; Congregationalist 9; Disciples of Christ 7; Evangelical 1; Lutheran—all bodies 6; Methodist Episcopal 17; Methodist Episcopal, South 9; Methodist Protestant 1; Methodist Episcopal, African 1; Presbyterian, U. S. 2; Presbyterian, U. S. A. 10; Presbyterian, Cumberland 1; Protestant Episcopal 9; Roman Catholic 25; Reformed 2; Universalist 2; and Unitarian 2.

The Chief of Cavalry

Within the past few months there has been introduced into the cavalry service the first American armored car unit, designated as the "First Armored Car Troop." This troop has been assigned to the First Cavalry Division at Fort Bliss, Texas, as the War Department has approved the recommendation that an armored car unit manned by cavalry personnel be adopted as an integral part of the cavalry division.

Motorization and Mechanization

Motorization. As regards motorization, there is no doubt but that in ordinary country, provided with a reasonable number of fair roads, motor transportation is of tremendous help to forces of all kinds. We cannot, however, afford completely to motorize the trains even of so large a unit as the cavalry division. Pack trains should always remain an element in the division train. It is believed that at least one wagon unit will also be essential in the cavalry division, although when suitable cross-country cargo vehicles are available in large quantities the matter of further substitution of wagons by motor vehicles should be

considered. In general, the line of development in motorization towards which the cavalry is working is to adopt motor equipment to the greatest extent possible, so long as each piece of motor equipment adds to the mobility of cavalry and does not interfere with its ability to go over any kind of country and under any conditions of road and weather. The use of motor trucks for the emergency transport of cavalry units has been studied and various experiments recently held. It is hoped that trucks equipped to carry cavalry will be equally well suited to carry infantry or artillery with their equipment.

Mechanization. As regards mechanization, it is believed that the horse-soldier, like the foot-soldier, cannot be replaced by any machine as yet developed nor is it anticipated that any such machine will be developed. So long as there are marshes to cross, rivers to swim, woods to pass through, or mountains to climb, just so long will the cavalryman and the infantryman be necessary. Tanks, tankettes, armored cars, armored airplanes, smoke projectors, gas and all modern means of warfare in use or still to be adopted cannot take the place of the man and the horse. They supplement the efforts of the man and the horse but they do not replace them.

The Chief of Infantry

Antiaircraft Defense. This has been one of the most outstanding tactical studies of the year, and one of most intense interest to the service at large, where it is generally accepted that, in addition to the protection furnished by the air corps and by troops of the antiaircraft service, it is imperative that troops on the march, in bivouac, and in battle, be able to protect themselves from air attack by low flying airplanes.

Motorization and Mechanization. Studies have been made of various schemes for placing our forces on a motorized and mechanized status. As a summary, it may be said that motorization and mechanization have many advantages over our present forms of transportation but that extensive experiments should be carried on before definitely committing ourselves to any one type of materiel and of organization. New forms of motor transport and of mechanized weapons now on hand, or appropriated for, are wholly inadequate for proper experimentation in organization and tactical methods. Complete combat units, the reinforced battalion and the reinforced brigade, should be equipped with the new forms of motor transport, etc., and given thorough tests in tactical employment under widely differing conditions of terrain and climate. Tests should be so conducted as to take advantage of the ingenuity of the greatest number of experienced individuals.

Extracts from the Annual Report of the Chief of Coast Artillery (Major General Andrew Hero, Jr.) to the Secretary of War for the Fiscal Year Ending June 30, 1928

General. For the Coast Artillery Corps the outstanding features of the fiscal year 1928 have been: Resumption of seacoast artillery battle practices in the United States; Improved tactical training incident to concentrations on both east and west coasts; A general improvement in artillery technique; Standardization of artillery practice methods, including the scoring system, and the preparation of a training regulation covering this subject; The adoption of a new system for controlled submarine mines; Revision of defensive sea area plans; A rapid advance toward standardization of sound ranging equipment and antiaircraft gun equipment, and hopeful progress toward solving the problem of antiaircraft machine gun fire at the longer ranges; Initiation of studies for the antiaircraft defense of important localities; and an increased strain upon personnel generally to maintain high standards of training and appearance, and at the same time to care for the valuable installations in their charge.

With the issue of G. O. 22, W. D. 1927, the missions of the Coast Artillery have been logically defined and the embarrassments to instruction and to preparation of training regu-

lations removed. Responsibility for heavy trench mortars has been transferred to the Field Artillery, leaving the Coast Artillery charged only with the development and use of weapons intended for fire on moving targets (naval or air) and of the auxiliaries necessary for control of such fire.

Training. Considering the various conditions Coast Artillery organizations serve under in our overseas and continental garrisons, progress in training of all units during the year has been praiseworthy.

Analyzed we find that 75% of the batteries fired at greater speed, the improvement being especially marked for the rapid fire armament. Greater range was attained by 77% of the batteries. Fifty-four per cent of the batteries improved in accuracy, the greatest improvement being noted for rapid fire armament. In hits per gun per minute improvement is noted in 78% of the batteries firing.

The improvement in seacoast artillery practice is attributed to the system of competition introduced in 1926. While not favorably received by some officers, there has been a general increase of accomplishment, interest, and enthusiasm. This is far more notable in the reports of those target practices for the calendar year 1928 which have been received to date than in the practices reported upon above.

Battle practices were held in each of the defended overseas possessions, at San Francisco, California, at the Harbor Defenses of Long Island Sound and at the Harbor Defenses of Long Island Sound and at the Harbor Defenses of Chesapeake Bay. While practices of this kind have been held from time to time in overseas possessions since the World War, inadequate personnel and other causes have prevented in the United States. The allotment of funds for troop movements incident to Coast Artillery training in the United States for the F. Y. 1928 enabled concentrations to be effected at the three harbors named. This gave valuable training to the higher echelons and has the added effect of placing in service some batteries and installations normally without manning parties, thus enabling us to ascertain the true condition of equipment. It is hoped to synchronize the annual encampment of National Guard units and the active training of Reserve Officers with these battle practices in future so that the more important harbor defenses in the United States may be placed, in turn, approximately on a war footing.

Minor joint exercises were held in the United States during the troop concentrations for the battle practices, the Navy furnishing in each instance such vessels as could be made available. In the Panama Canal Department a joint communication exercise was held in connection with a minor joint exercise off the Pacific entrance to the Canal, Army and Navy aircraft participating as well as the Navy Control Force and the Harbor Defenses. The exercise was of considerable value to the harbor defense troops but the greatest benefit derived was from ascertaining, in a practical manner, methods of coordinating the several systems of communication.

Extensive Joint Army and Navy exercises were held in the Hawaiian Department, in which all Coast Artillery units took part. That department apparently offers the best field for training of the combined arms in coast defense, with the Panama Canal Department a close second.

No report as to Joint Army and Navy exercises in the Philippine Department for the year reported upon has been received in this office.

While excellent results in tactical training are obtained at joint exercises, such as those held in the United States this year, it can not be denied that much is lost through the absence of mobile forces at these exercises. Even when these are only outlined by establishing the higher command posts for the defense of a section of the shore line, and a general attack is developed under the control of competent umpires, a sense of reality is introduced that enables these exercises to approximate in value those held in overseas territories. Only one such exercise has been held in the United States since the World War—that in the Narragansett Bay Area noted in my report of last year.

The Air Corps has been generous in supplying the planes necessary for Coast Artillery training but reports received indicate that, with two exceptions, lack of means has prevented progress in testing the regulations for joint employment of the Coast Artillery and Air Corps. The exceptions referred to are the Hawaiian and Panama Departments. In the former such joint action was featured in the exercises referred to above. In the latter a special exercise of attack and defense was featured. Plans were made for joint exercises in the Harbor Defenses of Chesapeake Bay but these had to be abandoned as the Air Corps was unable, without material curtailment of scheduled training, to supply planes and air ships in numbers sufficient. The training text referred to will necessarily have to be continued as a tentative regulation for the time being.

Materiel. The equipment for terrestrial sound ranging has been under development with the assistance of the Signal Corps. It has been given a service test during the last year and found satisfactory. It is expected that it will be adopted as standard within a short time.

The antiaircraft tests that have been held at Aberdeen Proving Ground, Md., during the past two years, through the close cooperation of the Ordnance Department, the Corps of Engineers, the Signal Corps and the Air Corps have resulted in surprising progress in antiaircraft fire control for guns. New equipment has been developed that so far exceeds the efficiency of the war time materiel now in service as to require immediate action to secure rearmament of antiaircraft gun units. Funds have been appropriated for the F. Y. 1929 to initiate this rearmament program. Fire control for machine guns beyond tracer ranges is still in an experimentl stage; various experimental devices which promise to solve this problem will be tested at Aberdeen Proving Ground this fall.

A comparatively inexpensive type of emplacement for 155-mm. guns has been designed and given a satisfactory service test in Panama. It allows the trails to be moved quickly and this gives the gun 180 degrees, or, if desired, 360 degrees of field of fire. As the gun has only a limited traverse on its carriage, this type of emplacement adds considerably to its usefulness against rapidly moving targets.

The personnel of the 52d Coast Artillery (Ry) have devised a system of ammunition service from car to gun enabling loading to be continuous throughout a wide traverse of the piece. As a result, the falling off in rate of fire noted for the calendar year 1927 has been corrected and an improvement will be recorded for the present year.

Conclusions. In technical training the condition of the Corps is satisfactory in all branches.

In tactical training there has been a marked advance during the past year. This should be continued by the allotment of the necessary funds for troop movements. It is very desirable that the minor joint exercises be extended by outlining, at least, the mobile coast defense forces for sectors of the coast line adjoining the harbor defenses at which these exercises are held, and that sufficient aircraft be made available to develop the Air Corps' mission in coast defense.

The progress of development work toward standardization of equipment has been gratifying.

Military Situation of Holland

Fort Eustis, Va.,
Nov. 1, 1928.

Subject: Correction of an article appearing in the Coast Artillery Journal.
To: The Editor.

1. It has been brought to my attention that in an article on *The Military Situation of Holland*, written by me, and appearing in the July number of the Coast Artillery Journal, certain statements were made which now appear to be in error. At the time this article was written, (January, 1928) the data available on these questions were considered

reliable, but recent information leads me to believe that either the authorities were wrong or the situation has changed since the paper was written. As this article appears, it purports to show the present-day conditions in Holland, and these conditions do not appear to be the same as the article would lead one to believe.

2. On page 39, the following statement is made: "Since the World War, Holland has become more and more remiss about clearing the Scheldt Channel. The last year or two the channel has started to fill up and is now seriously interfering with the ships attempting to reach Antwerp. The Belgians have protested several times, and even offered to dredge the channel themselves, but Holland will not do the work nor allow them to do it."

In an address delivered on June 12, 1928 to the representatives of the Belgian Press, and quoted in the Belgian *La Metropole*, M. Tobie Claes, Director of the Maritime Services of the Scheldt, denies most emphatically the current rumors that Holland has been lax or wilfully neglectful of her part of the dredging of the Scheldt Channel. He further states, in *La Libre* (Belgian) that "it is a calumny to say that Holland gives evidence of ill will towards us and is planning to let the Scheldt silt up in that part of the river that is found on Dutch territory in order to make the port of Rotterdam indispensable." These statements of M. Claes are borne out by M. Baels, the Belgian Minister of Agriculture and Public Works, in a debate before the Senate on April 4, 1928. M. Baels quotes M. Melotte, the Director General, who states that rumors that Holland had failed to fulfill her part of the dredging operations were absolutely false.

It is apparent that statements from such leading Belgian authorities on the question of the Scheldt River must be accepted as being correct.

3. In regard to the discussion of the Port of Antwerp and the question of the Dutch-Belgian Treaty, more recent developments have shown that, due to the increasing understanding and accord between the two nations, the questions will undoubtedly be settled without referring them to the signatories of the Versailles Treaty.

4. In view of the information contained in the preceding paragraphs, I think that these corrections should be published in order to give a fair description of the relations between Belgium and Holland.

Carl B. Wahle,
1st Lieut., 51st C. A.

Government Insures Supply of Helium for Military Dirigibles

The successful transaltantic flight of the monster dirigible, the *Graf Zeppelin*, and the announcement by the Navy Department of the awarding of a contract for two Leviathans of the air of far larger dimensions even than the great German airship, have aroused keen interest in the possibilities of safe and rapid travel by means of these huge lighter-than-air craft. Great Britain is constructing two palatial dirigibles, intended for trans-oceanic service, and private American interests have taken up in earnest the manufacture of gigantic air liners.

If these argosies of the air are to offer the real assurance of safety necessary to their completely successful use, it is essential that they depend for buoyance on a non-flammable gas. The only gas of this description having the requirement of lightness is helium, that very rare element which is found, in small proportions, in certain natural gases. As is well known, the hydrogen gas used as the lifting agent of the *Graf Zeppelin* is extremely explosive, and the accidental ignition of hydrogen has been responsible for disasters to various airships in the past.

The dirigibles operated by the Army and the Navy of the United States are provided with helium, but all foreign-owned air-craft must depend on the highly inflammable hydrogen for their buoyancy. This situation is due to the fact that the United States is the only nation, so far as known, having sufficient resources of helium to develop a commercial supply for aeronautics.

It requires, however, a great amount of helium to fill the gas cells of a big dirigible, a little over two and one-half million cubic feet of helium being needed for the *Los Angeles*. In those rather rare natural gas deposits which contain any helium at all, no more than between 1 and 2 per cent by volume of the gas can be extracted as pure helium.

The known natural gas fields to which the United States can look for obtaining its helium are not inexhaustible. In fact, the Petrolia field in northern Texas, which has been the principal source of supply, is now in the last stages of its life after producing gas for more than twenty years. Where, then, are to be obtained the large supplies of helium which will be necessary for the continued safe operation of the two air-monsters recently contracted for by the Navy and other ships which will be built from time to time?

The maintenance of these vital helium supplies is one of the jobs which have been put up to the United States Bureau of Mines, of the Department of Commerce, the scientific bureau which has kept Uncle Sam in helium for the past several years. For years the chemists of the Bureau of Mines have been analyzing samples of natural gas obtained from many gas fields located throughout the country, always in quest of the characteristic bright yellow line which, viewed through the spectroscope, announces the presence of the prized helium. This analytical work has resulted in accumulating valuable data regarding our helium resources, and the answer to the question as to where Uncle Sam is to obtain his helium, for some time to come, at least, has been found, it is considered, in the Cliffside natural gas structure lying to the northwest of the city of Amarillo, in the Panhandle district of Texas. A big helium production plant, embodying in its helium separation cycle the results of thorough research on the part of the Bureau's specialists, is nearing completion near the town site of Soncy, about six miles west of Amarillo, and from the natural gas of the Cliffside structure, which has been found to have a helium content of about 1¾ per cent by volume, will be extracted the supplies of the wonder gas which will keep aloft Uncle Sam's giant air cruisers of the future.

The story of helium has been called one of the romances of science. Viewed through the spectroscope, helium, made incandescent by an electric discharge, displays a bright yellow line characteristic of this gas. This line was first made visible to man when in 1868 a group of scientific investigators in India for the first time turned a spectroscope on the chomosphere, that part of the atmosphere of the sun, about 10,000 miles deep, which merges into the corona. Recognizing an element in the sun not previously discovered on the earth the new element was given the name "helium" from the Greek word "Helios," the sun. Not until the latter part of 1894 was terrestrial helium discovered, when Sir William Ramsay, the eminent English scientist, found the bright yellow helium line in an inert gas obtained from the radio-active mineral cleveite. Dr. W. F. Hillebrand of the United States Geological Survey had obtained this same gas from the same source, but did not identify the helium in it.

Helium is found in the atmosphere in the proportion of one part in 185,000 parts. It is found in minute quantities in sea and river water, in the gases evolved from many mineral springs and in some volcanic gases, but in none of these latter sources is the gas sufficiently plentiful to provide commercial supplies.

Helium production for use in lighter-than-air craft was started by the United States government during the World War. A thorough study was made of fields which contained helium-bearing natural gas, by specialists of the United States Bureau of Mines and the United States Geological Survey. As a result, it was established that the Petrolia gas field, of Clay County, Texas, was at that time the field best suited as a source of supply for the government's initial helium development.

At the inception of the development work three plants were constructed to try out experiments on helium production. Three firms, the Linde Air Products Company, the Air Reduction Company, and the Jeffries-Norton Corporation, active in kindred lines, cooperated with the Government in this project, using modifications of their processes for the purpose. Two of the plants were erected at Fort Worth and one at Petrolia, and all three were

supplied with gas from the Petrolia gas fields. Funds for development work were provided by allotment from the War and Navy Departments.

Following this experimental work, a plant using the process developed by the cooperating Linde Air Products Company was constructed at Fort Worth under the jurisdiction of the Navy Department. This plant has been operated continuously since October, 1922, and has produced probably 90 per cent of all the helium that has been produced in the world. The separation cycle has been operated by the Linde Air Products Company under contract with the government. Until July 1, 1925, this plant was under the jurisdiction of the Navy Department. On that date it passed by legislative enactment under the jurisdiction of the Bureau of Mines and it has since been operated under the direction of that bureau.

It has long been realized that existing facilities for helium production did not give adequate assurance for the future. Therefore, the increasing information concerning the nation's helium resources gathered by the Bureau of Mines was given careful review and study with the object of discovering a helium resource which could be more surely relied upon for both present and future production. The Cliffside structure of the Amarillo gas field, which had been discovered after the initial operations at Fort Worth were started, was found, after prolonged and careful investigation, to contain a large reserve of gas of relatively high helium content. Comparison with other sources showed it to be the most favorable of all known fields when cost of production, possibilities of conservation, and all other factors were taken into account. Therefore, it was selected as the source of supply for the new helium production project. As the gas of the Cliffside structure is approximately twice as rich in helium as that from the Petrolia field, and as conditions are such that this gas can be conserved, it is believed that the new Amarillo project will provide a supply of helium for the government's lighter-than-air craft operations for many years to come.

Rapid progress is being made in the construction of the new plant, occupying a site of about 18½ acres, at Soncy, about six miles west of the city of Amarillo. The buildings have been completed and the equipment is now being installed. Gas for the project is to be supplied by the Amarillo Oil Company under a contract with the government covering gas rights in 26,000 acres of land on the Cliffside structure. The company now has three gas wells with a combined open flow of 27,000,000 cubic feet per day available for the exclusive use of the plant. A fourth well now being drilled has reached the gas producing horizon and the completion of this well is expected within a short time.

In the new Soncy plant, the helium will be recovered by cooling the gas to approximately 300 degrees Fahrenheit below zero, at which temperature all of the constituents of the gas, except the helium, are liquefied, permitting the helium to be drawn off as a gas and compressed into tank cars or steel cylinders for shipment to points where it will be used primarily in the Army and Navy lighter-than-air craft. The extremely low temperature to be used in the plant will be produced by compression, and subsequent expansion of the gases. At the minimum plant temperature, atmospheric air is a liquid, carbon dioxide and mercury are solids, lead and copper take on properties of steel, and rubber is as brittle as glass. In comparison, such temperatures as are found at the North Pole would be unbearably hot. Placing an icicle in the liquefied gases in this plant would be like thrusting a hot poker into water.

The Cryogenic Laboratory of the Bureau of Mines, in which data for use in improving helium production and purification processes are developed, contains complete equipment for conducting research at low temperatures. Because of the extremely low temperature at which certain operations are conducted in this laboratory it has been called "the coldest spot in the world."

Before the United States entered the World War, helium had been obtained only in small amounts as a curiosity in scientific laboratories. The total quantity recovered probably did not exceed 100 cubic feet and the cost of production was about $2,000 per cubic foot. As the result of the investigative work of the Bureau of Mines, in cooperation with

the Army, the Navy, the Linde Air Products Company and others, the cost of production of helium has now been brought down to but a few cents per cubic foot.

During use in airships, helium escapes and air enters through the walls of the gas cells; therefore, at intervals the helium in an airship must be removed, purified, replenished, and put back. Three helium purification plants have been designed by the Bureau of Mines and constructed under its direction. The first of these is a stationary plant at Lakehurst, N. J., built for the Navy; the second, a mobile plant mounted in a railroad car, built for the Army; and the third is a stationary plant for the Army erected at Scott Field, Ill. The Scott Field plant is capable of purifying 10,000 cubic feet of helium per hour.

Ten Years After the Armistice

A decade has passed since the world emerged from its grisly nightmare, and we have learned that the will for peace moves slowly. Although we have made appreciable advances, not yet have we attained the object for which the great war was fought. We have proof that a change is coming over the earth, but we cannot as yet say that war has been banished utterly.

Perils escaped have the quality of seeming smaller as they recede into the past. In the enjoyment of unexampled prosperity we are apt to forget the lessons of the last war and of preceding wars. We are prone to overlook, for instance, that all our conflicts have been brought on by the lack of adequate defenses. Because we have neglected to make prudent provision against war, our sacrifices in human life and in treasure have been doubled or trebled. When there is no cloud on our horizon it is easy to forget that there can be no security without reasonable readiness for defense.

* * * * *

America has attained a degree of prosperity never before experienced by any nation. Our commerce and industry have reached unexampled heights. Our rich argosies are dispatched to every quarter of the globe. Our material well-being excites the admiration, and sometimes the envy, of less fortunate nations. Ten years after the war we still face the fact that nations have their own aims and aspirations, their hatreds and their jealousies. There are disputes abroad that might lead to war, notwithstanding the solemn pledge to refrain. And in this situation we see the nations marking time. None thinks of disarming either on land or at sea.

* * * * *

In the year 1928 it would be an act of faithlessness to those who gave their lives in the country's defense to listen to the fallacies of the little Navy men and the pacifists. Our policy should be to maintain establishments on land and sea sufficient to serve us in any circumstances.—*Seattle Times.*

"The true spirit of economy relative to war, is to eliminate or decrease the cost of war by paying the insurance rate of protection against such a calamity." Secretary of War John W. Weeks, Address in San Francisco, May 25, 1923.

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. W. E. Cole, *Colonel, Coast Artillery Corps, President, Coast Artillery Board.*

Project No. 657, Targets for Antiaircraft Artillery Target Practice.—A study of correspondence between the Chief of Coast Artillery and the Chief of Air Corps, with reference to the use of gliders to be launched from an airplane; the design of towing gear to permit of abrupt changes in course of the target by diving, climbing, etc.; the equipping of airplanes to permit of more than one target sleeve being carried; and the practicability of conducting target practice with three tow-planes flying in formation, each equipped with a sleeve target.

Project No. 658, Machine-Gun Antiaircraft Service (For Defense of Ground Troops Against Aircraft).—A study of a method of mounting and operating an antiaircraft machine gun from an infantry cart. The Board, after due consideration of accompanying papers, recommended that the machine-gun mount described is not at present applicable to coast artillery units.

Project No. 659, "Crichlow" System of Spotting and Plotting for A. A. Firing.—A description of a system of spotting antiaircraft fire and applying the results. After completion of the Aberdeen exercises this system will be studied in comparison with the one now being employed at Aberdeen, and the Coast Artillery Board will submit comments and recommendations covering the practicability of applying a scheme of this type in antiaircraft organizations.

Project No. 660, Service Test of Type P-12 (Radio) Headsets.—This new type headset was developed at the Signal Corps Radio Laboratories and is designed to replace the P-11 for all field uses. The headsets embody several new features and are now undergoing service test.

Project No. 661, Illumination of Mortar Pits and Gun Emplacements for Night Firing.—The Board has under study the problem of the proper illumination of mortar pits and gun emplacements.

Project No. 662, Service Test of Modified Experimental Diaphragm Gas Masks.—The Board has been furnished with 20 of the latest type experimental diaphragm gas masks. These masks are undergoing service test.

Project No. 663, Effect of Large-Diameter Propelling Charges on Excessive Pressures.—Proper ramming of powder charges will serve to eliminate one of the causes of excessive pressure. The Board recommended that the rammer staff be provided with a red band to indicate the correct position of the powder charge in the chamber. (See also, Section V, Circular 46, W. D., 1928.)

Project No. 664, "Clark-Hoyt" Spotting Board.—A Spotting Board, designed by Captains Clark and Hoyt of the Coast Artillery Reserve and used in target practice at Fort Hancock, N. J., during the past summer, is under study by the Board to determine its suitability for Coast Artillery use.

Project No. 665, Source of Power Supply for Field Telephones in Fire-Control Car, Railway Artillery.—This is a system worked out by the 52d Coast Artillery (Ry) and is a method of furnishing power to all telephones within a fire-control car from a common battery, standard retardation coils being used to prevent cross-talk. Telephones outside fire-control cars are equipped with local batteries.

BOOK REVIEWS

Some Memories of a Soldier. By Major General Hugh Lenox Scott, U. S. Army, Retired. The Century Co. 1928. 5¾"x 8¾". 673 pp. Ill. $5.00.

SCOTT, HUGH L. (012989) Born Kentucky 22 Sept 1853; Cadet, US Military Academy 1 July 1871; 2d Lt 9 Cavalry 15 June 1876; transferred to 7th Cavalry 26 June 1876; 1st Lt 28 June 1878; Captain of Cavalry 24 Jan 1895; Major 25 Feb 1903; Lt Col 3 March 1911; Colonel 18 Aug 1911; Brig Gen 23 March 1913; Maj Gen 30 Apl 1915. Distinguished Service Medal. General Staff 22 April 1914 to 16 Nov 1914; Chief of Staff 17 Nov 1914 to 22 Sept 1917; retired 22 Sept 1917 by operation of law. L. H. D. Princeton 1910; LL. D. Columbia 1914; D. S. Penna. Military College 1916.

Such is the terse record of General Scott as shown in the Army Register, for that is the Army way. General Pershing's record is hardly more extensive. There is very little color in official records and for that very reason one welcomes private and personal accounts of "The Old Army" . . . especially when they are given by one who truthfully can say:

"All of which I saw and a part of which I was."

General Scott's book is frankly a personal narrative. As its title indicates, it is an account of what he saw and did during his army career of more than 46 years. These recollections are grouped chronologically into ten distinct periods: boyhood and West Point, service on the Plains, Cuba, the Philippines, Superintendent at West Point, the Border, the World War, the Russian Revolution, France and England, and Camp Dix.

The second period or "part" has special interest for those who enjoy the atmosphere of our vanished Wild West. The Indian figures largely in this part of the book, and as a human being—not as a figment of the imagination. Indian fighting is absent but the atmosphere is there, as for instance in the account of the author's visit to the scene of the Custer massacre on the first anniversary of that battle. It was during this period that Lieutenant Scott made a study of the Indian sign language, his knowledge of which later brought him no little fame. He had good opportunities to observe the deplorable manner in which Indian affairs were handled from Washington; his protests against the injustices meted out to the Indian on repeated occasions impress this reader as markedly restrained. Worthy of mention is the description of what was probably the last case of "drumming out of the service" . . . in 1877.

Captain Scott reached Cuba after the Spanish-American War was over and hence Part III, of some 70 pages, is devoted to his administrative duties during the period of reconstruction in Cuba.

In 1902 he accompanied General Leonard Wood to the Philippines and became military governor of the Sulu archipelago. Here are 150 pages that are welcome indeed to those who served in the Land of Dhobie Dreams during the Days of the Empire. To the civilian, too, this part of the book is interesting in its accounts of Moro activities.

Next Colonel Scott relates his experiences from 1909 to 1914: walks in Rock Creek Park with President Roosevelt, his friendly guidance of President Wilson in military and Philippine policy, his importation of the posting seat in the Cavalry, his settlement of various Indian troubles, and finally his activities in the Mexican border trouble.

General Scott's chapter relating to the World War depicts the indecision and confusion which attended our entrance into the World War. There are but few accounts of the inside workings at Washington during this parlous time and for this reason General Scott's observations are all the more welcome. Perhaps some authorities might disagree with him over the relative importance of the factors responsible for whatever success we may have

achieved in the World War. General Scott rates the Army's administrative system first, as is more or less natural to an administrative expert. The concensus of lay opinion, however, seems to have been that the "system" of the Army was rotten. No allowance was made for the fact that this rottenness—imaginary or real—was directly the result of agencies outside the Army itself: restrictive legislation, decisions and regulations from Washington. Is it not told that one of our Quartermaster Generals bitterly complained because "Just as I get a perfect system going, along comes a war and ruins it"? Be that as it may, General Scott throws some interesting side lights on the activities of wartime Washington.

Two months after we entered the war General Scott accompanied the Root Mission to Russia in the endeavor to keep Russia fighting on the side of the Allies. Among his observations covering this trip is:

> I saw only one custom in Russia which I though worth adopting into our army. Whenever an officer of rank enters a barrack room, the men all stand attention and call out in a loud voice in unison, 'Good morning, my General!' and are answered, 'Good morning, my children!' . . . a custom I liked very much.

That is doubtless a likable custom but this reviewer would enjoy watching (at a safe distance) an attempt to introducc it into certain units of the US Army—a mule battery by preference!

The Root Mission occupied General Scott for about three months, leaving him only about two months to serve as Chief of Staff before his retirement on September 22, 1917. Early in October he sailed for England and France for a tour of the battle front, preparatory to taking command of the 87th Division at Camp Dix. His description of service at Camp Dix is invaluable in that it shows the change in viewpoint whcih invariably accompanies a change from staff to line duty or the reverse. Even General Wood showed the same change.

The book is pleasant reading. It gives the civilian an insight into Army ways which otherwise would be hard to obtain; it recalls to the Service reader many pleasant experiences—in the West, in Cuba, or in the Philippines. The numerous letters of commendation which pepper the book remind one of exhibits in the proceeding of a Class B board, but they are rendered less objectionable by the author's long and honorable career.—P. D. B.

America's Part. By Henry J. Reilly, Brigadier General, O. R. C. Cosmopolitan Book Corp. 1928. 5½"x 8". 326 pp. Ill. $3.50.

The title of this book does not indicate its contents as comprehensibly as another could. It is easy to read, understandingly written, and should be of benefit to any one. It evidently is not put forth as a military text-book, and this blunt fighter's style displays a curiously agreeable mixture of professional soldier, newspaper editorial, and political training. "Who won the War" has ever been debated, and no majority will ever be convinced.

In the book there are some inaccuracies, but none of moment. The quotation of a few citations and the omission of many, many others to prove our courage when so many thousands were involved, is not intentional. Failure to mention the heroic medicos and auxiliaries, the S. O. S., our own Russian attempt, and the help given the non-combatants during and after the war is pardonable in the Professional Soldier. Again, disregard for the various Government reasons for interference or unpreparedness is likewise the fighter's view.

The book demonstrates that for once our own Government picked the right man at the start in our immortal "Black Jack," and stayed with him. There were several others to chose from, and when the choice was made those others did not bicker as in the other wars but set an example of magnificent cooperation for us all.

The book very clearly and interestingly affords the laymen a general idea and understanding of wars, war tragedy, and diplomacy leading up to 1914, the frustration of German plans in 1918, and Uncle Sam's participation in it. Any U. S. veteran can use his memory and with the book's information orient himself over there again.—J. J. V. P.

The War Department, 1861: A Study in Mobilization and Administration. By A. Howard Meneely, Ph. D. New York. Columbia University Press. 1928. 6″x 9″. 400 pp. $6.00.

Of no period in the history of the United States is it more difficult to write than of the Civil War, and no period has a greater wealth of material available for research. The trouble is that so many of the documents fail to respond satisfactorily to the usual tests. Confusion, misunderstanding, ignorance of facts, and self interest so becloud the issues that the historiographer must be possessed of a wealth of patience if he is to arrive at the true causes and effects of the events of that period. Mr. Meneely found it so, and his story, when he finally dug out the facts, was one of cross purposes, conflicts in authority, juggling, competition between purchasing agencies, and lack of coordination everywhere.

The military man could have told him that that was what he would find. Our history leads us to expect such conditions at the outbreak of any war. We Americans are a warlike people but we heartily disrelish being called so and will deny it. We take pride in pretending to believe that we are peaceful, but note how joyously we go to war when war comes. Therein lies our difficulty, for it leads to two delusions: First, that we need no army in time of peace, and second, that if ever we should require an army we can raise enough men overnight to whip all creation.

War thus has always found us unprepared. We had more men in the Mexican war than we could equip, and the same situation arose at the outbreak of the Civil War. Mr. Meneely wanted detailed facts and his efforts have been most painstaking. He started with the intention of investigating the War Department through the four years of the war, but he early found that the task was too much for a single volume. Restricting the scope of his work to Mr. Cameron's administration of Departmental affairs has enabled him to give a fuller account of governmental activities in raising, arming, and equipping the army than would otherwise have been the case.

The study is masterly and is fully annotated, although he quotes primary and secondary sources to about an equal extent. In his bibliography, however, he classifies his source material and we may see at a glance his authorities in their approximate order of authoritativeness—the list fills nine pages. Incidentally, we note that some of his material came from the Quartermaster's Office at Fort Myer, *Maryland.*

This is not a book which may be read in a single evening. It must be studied, and it will repay study, for its scope is not restricted to the War Department. We see Fremont in the West, Butler in the East, Wool in New York, agents in the Central Atlantic states, and state-appointed purchasing agents in Europe. Drawn together, they all help to picture the problems which confronted the Administration, and in the end we can only wonder that Mr. Lincoln's patience endured.

Handbook of Napoleon Bonaparte. By Irar L. Sjöström. Philadelphia. Dorrance and Company. 1928. 5¾″x 5½″. 145 pp. $1.50.

An Army officer is always interested in the career of Napoleon Bonaparte but he is frequently at a loss when attempting to place quickly some event or some date connected with the "Little Corporal." In such a case he needs this handbook, which is in reality a check-list to the great mass of material written about this famous son of Corsica. The first part of the book is a chronological table of the principal events in Napoleon's career. Following this are a few descriptions of his personal appearance as recorded by actual observers. The remaining, and by far the larger, part of the volume is devoted to a table, alphabetically arranged, recording persons, places, and events connected with Napoleon. Each entry is accomplished by a brief descriptive or explanatory note recalling to mind the association with Napoleon and connecting the person, place, or event with his career. Inside the back cover is a map illustrating Napoleon's activities.

This is a valuable and practicable little reference book.

Bullets and Bolos. By Colonel John R. White, Philippine Constabulary, Retired. The Century Co. 1928. 5¼"x 7¾". 348 pp. Ill. $3.50.

This is a well-told narrative of thirteen years' service as an officer of the Philippine Constabulary. The bulk of the book deals with the writer's first five breathless years of active field service in Negros, Mindanao, and Sulu, culminating at Bud Dajo, where he was severely wounded. His subsequent, less picturesque duties in charge of the penal colony at Iwahig and the Constabulary Academy at Baguio are outlined more briefly. His story presents an entertaining series of adventures and a vivid outline of Philippine conditions from "the days of the Empire" to the period of "Filipinization." The military reader will be especially interested in his impressions of Generals Wood, Allen, Harbord, and Scott, and in his insistence that the regular officer, whose contacts with a single tribe never exceeded two years and seldom approached that period, lacked that understanding of native ways which would have gone far to avert needless friction.—F. M. G.

Following the Flag: Diary of a Soldier's Wife. By Alice Applegate Sargent. Kansas City: E. B. Barnett. 1928. 5¼"x 8". 91 pp. $1.10.

The author was the wife of the late Colonel Herbert H. Sargent, who will long be remembered for his *Campaign of Santiago de Cuba.* The book is a narrative of events following the author's marriage in 1880. As an Army wife, she followed her husband around the world—to Fort Klamath, Fort Bidwell, Fort Walla Walla, Fort Huachuca, Fort Bowie, Fort Logan, Fort Wingate, Cuba, Washington, twice to the Philippines, and elsewhere—as Army wives do. Except in detail, her experiences were those of any Army woman and except in name her stations were those the other wives know.

"Pack and move" is one thing to which all must become accustomed in the Army, and Mrs. Sargent's account is all the more interesting in that one can read one's own experiences into the narrative. The account is all too brief to be absorbing. One cannot pack the experiences of forty-two years into ninety pages and have more than a synopsis. It is to be regretted that the account was not expanded to present a more complete picture of life in the West in the 'Nineties and in the Philippines during the Insurrection.

Simon Girty: The White Savage. By Thomas Boyd. New York: Minton Balch & Company. 1928. 6"x 8". 252 pp. Ill. $3.50.

The author does not believe Simon Girty was quite the blood-thirsty renegade his contemporaries would have us believe. That he was a cold-blooded roughneck cannot be denied, but it is not the author's purpose to attempt to excuse him. Going back to original sources, Mr. Boyd has made an dispassionate study of this white man who spent so many years among the Indians and who fought with Indians against white men and with the white men against Indians. He finds such good points as Girty possessed, and he finds that Girty was on a number of occasions an inactive, if not unwilling, participant in some of the butcheries committed by his red brethren.

The account is concerned chiefly with the period between Lord Dunmore's War and the battle of Fallen Timber, where Mad Anthony Wayne broke the power of the Shawanese, Miamis, Delawares, and Wyandots and cleared the Ohio country for white pioneers. During these years the whites were pressing more and more westward into the Indian country west of Pittsburgh, and Indian resentment at this invasion kept the whole frontier in a constant state of alarm. After the defeat of the Indians, Girty retired to his cabin not far from Malden, in Ontario, where he lived until his death in 1818, at seventy-seven years of age—one of the few human beings who had outlived his published obituary.

The author seeks to "explain" Siomn Girty. Perhaps he has done so. At any rate he has given us an interesting narrative of an unusual man and at the end, although not altogether convinced, we are willing to admit that Girty may not have been as bad as he was painted.

How to Talk. By John Mantle Clapp and Edwin A. Kane. The Ronald Press Co. 1928. 5¾"x 8½". 647 pp. $5.00.

This is a text and reference book of such value that it is hoped it will not be confused with the highly advertised "How to out-orate Cicero or Wm. J. Bryan in ten lessons." It is a beautiful demonstration of how to talk itself, and would be of equally great benefit to class room or to individual without the assistance of instructors. Its chapters and paragraphs even are correctly and clearly titled and sub-titled. The index leaves nothing to be desired. Every phase of conversation, speech, and communication is analyzed; methods of correction are carefully outlined. By the use of its precepts, improvement of speech, whether it be story telling, business communication or address, will be possible.—J. J. V. P.

Morrow's Almanack for the Year of Our Lord 1929. Burton Rascoe, ed. New York: Wm. Morrow & Co. 1928. 5"x 8". 319 pp. Ill. $2.50.

This book has no place in the bookcase or on the library shelves. It belongs on the library table or desk where it will be nearest at hand. There is nothing else like it, and the welcome it received last year will certainly become enthusiasm this year. Whatever the mood, there is something in the book to fit, and everything in the book will repay reading more than once. The title page indicates the scope:

> As in the 1928 ALMANACK an UNIQUE & ENTERTAINING observatory of Men & Manners, the past, present, & future. WIT for the light minded & instructions for the serious. All as set down by the DISTINGUISHED WRITERS who have contributed to this *vol.* pieces *never before seen in print.* With Calendars, Forecasts, Prophecies for the Weather, the fashions, lunations, horoscopes, advice on Human Foibles, receipes, & Preventatives.

These "distinguished writers," number something like sixty "famous moderns," to say nothing of "many ancient Scholars and Poets." Among the list of contributors may be noted Achmed Abdullah, Richard Atwater, Ilse Bischoff, George M. Cohan, Padraic Colum, Ford Madox Ford, Louis Golding, Rupert Hughes, John Macy, Westbrook Pegler, Herb Roth, and Elliott White Springs. What more need be said? If they cannot amuse you, you are hopeless.

How to Write. By Those Who Can. Compiled by Robert Watson, F. R. G. S. Ottawa: The Graphic Publishers, Ltd. 1928. 4¼"x 6¼". 161 pp. $1.00.

This little volume consists of some four hundred and ten short quotations from the works of authors, commentators, philosophers, and critics dealing with important phases of the art of literature. These are classified and so arranged that they lead naturally from the subject of making a beginning through the various phases of development to the artistic in literature. An index assists in ready reference.

The aspiring young author will find inspiration in the volume and the general reader will find pleasure in the quotations.

The Blue Gingham Cook Book. By Imogene B. Wolcott. New York: William Morrow and Company. 1928. 5½"x 8". 481 pp. Ill. $2.75.

Army wives in these days spend much of their time doing their own cooking and are always grateful for any suggestions which will help keep the maount of work within reason

and which will vary the meals in a satisfactory manner. This volume does both. Mrs. Wolcott, in an endeavor to secure the best possible collection of American receipes, asked all the leading manufacturers of foodstuffs for their choicest receipes. These she tested in her own kitchen, and from them she selected those which were most satisfactory from the housewife's point of view—time, labor, and results. Her selections include 2981 receipes.

The book is arranged in a simple, logical manner and is fully indexed. Many novel receipes appear—as service of sausage on apricots or pineapple. A novelty in bookbinding is the waterproof oil-cloth cover with which the book is provided, enabling it to withstand the wear and tear of kitchen usage. A valuable book.

"These camps are a democracy of youth, without distinction of wealth, of dress, of opportunity, or of responsibility. They develop an understanding between the selected youthful representatives from all sections and from the many walks of life, and for our coming generation, will make our country a better place in which to live." Robert L. Bullard, Radio Address, April 21, 1923. War Department press release.

THE COAST ARTILLERY JOURNAL

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MAJOR ROBERT ARTHUR, C. A. C. . . . . *Editor and Manager*
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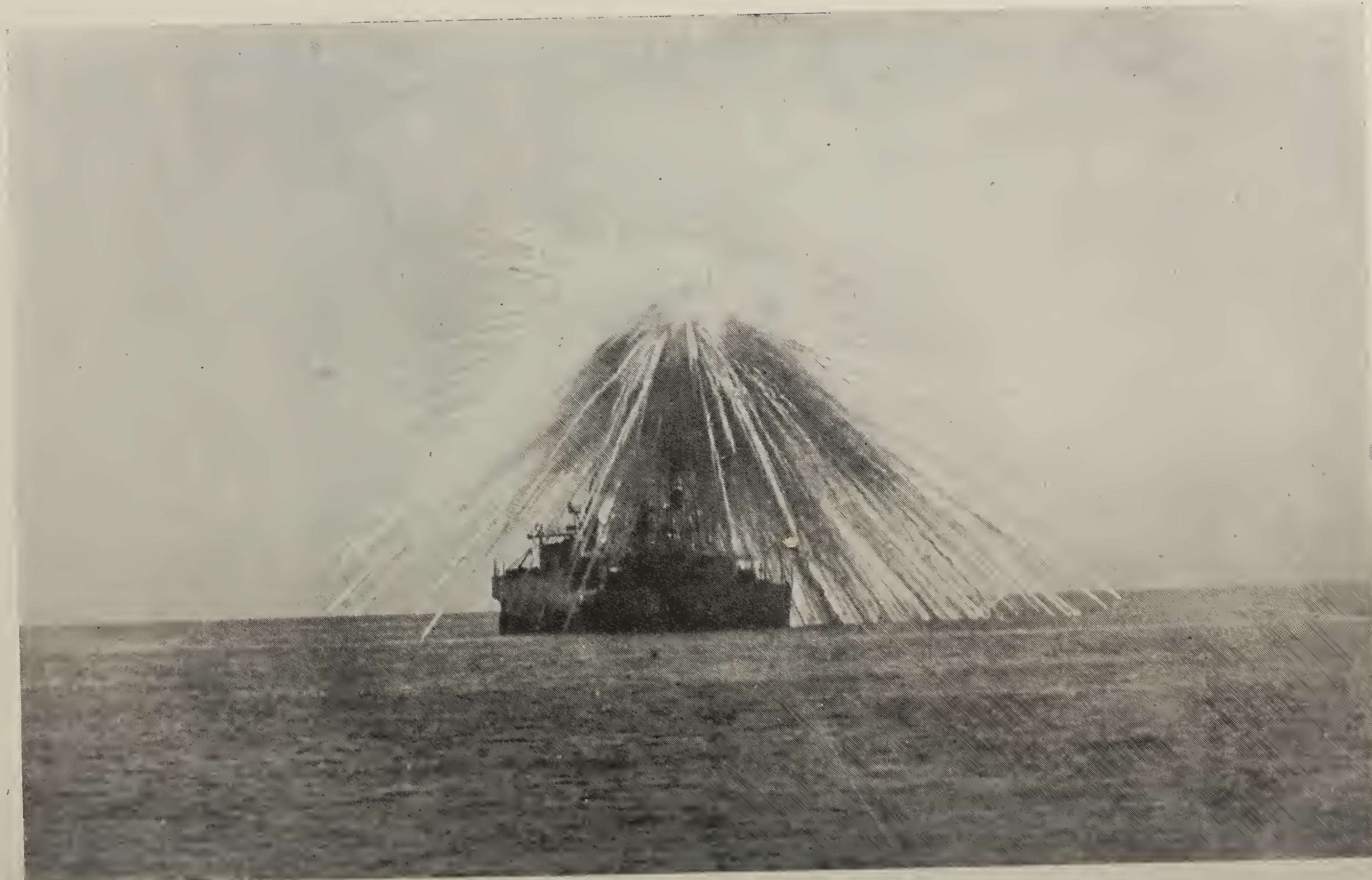

Battleship Hit By Phosphorus Bomb

THE COAST ARTILLERY JOURNAL

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Coast Artillery Board

By COLONEL W. E. COLE, C. A. C.

A statement of the early organization of the Coast Artillery Board and the changes and orders that have affected it since the date of its organization may be found in the COAST ARTILLERY JOURNAL of June, 1924, wherein is printed a lecture, "A History of the Coast Artillery Board and Its Work," by Colonel Henry J. Hatch, C. A. C., then President of the Board. The Board is at present governed by AR 90-20, 1926, of which I desire to invite attention to par. 2:

> PURPOSE.—The purpose of the Coast Artillery Board is to consider subjects pertaining to the Coast Artillery upon which the Chief of Coast Artillery may desire the board's opinion and recommendation, and to originate and submit to the Chief of Coast Artillery recommendations with a view to the improvement of the Coast Artillery Corps.

The purpose of the board as given therein has been substantially the same since its organization. With such a purpose it can readily be understood that the Coast Artillery Board has necessarily been closely associated with the development and progress of the Coast Artillery Corps. For an understanding of what this development has been I invite attention to the condition of the coast fortifications as they existed a few years after the close of the Civil War. During that war our defenses were, in general, regarded as satisfactory, but due to the adoption of rifled cannon and armored ships by the navies of the world this was no longer true nor was there any plant in this country equipped to manufacture high-powered rifled guns. In 1883 the Congress took decisive steps to remedy this condition and passed an act which authorized the appointment of a board of Army and Navy officers:

> For the purpose of examining and reporting to Congress which of the navy yards and arsenals owned by the Government has the best location and is best adapted for the establishment of a Government foundry or what other method, if any, should be adopted for the manufacture of heavy ordnance adapted to modern warfare for the use of the Army and Navy of the United States.

This Board, known as the "Gun Foundry Board," made its reports in 1884 and directed public attention, not only to the defenseless condition of our coasts, but to the importance and necessity of formulating a comprehensive scheme for the protection of our harbors and coast cities.

As a result, the Act of Congress approved March 3, 1885, provided that:

> The President of the United States shall appoint a board . . . which board shall examine and report at what ports fortifications or other defenses are must urgently required, the character and kind of defenses best adapted to each with reference to armament, the utilization of torpedoes, mines, and other defensive appliances.

The Board organized under the foregoing provision of law, popularly known as the Endicott Board, in its report of January 23, 1886, cited the principles on which any system of coast defense should be based and clearly stated the necessity of having our important strategic and commercial centers made secure against naval attack.

Public opinion was further directed to the urgent need of coast defenses by men of prominence, as shown by the following extract from a letter written by Mr. Samuel J. Tilden, on December 1, 1885, to the Hon. John G. Carlisle, afterwards Speaker of the House of Representatives, on our coast defenses:

> A still greater defect exists in our coast defenses. The range of the best modern artillery has become so extended that our present fortifications designed to protect the harbor of New York, where two-thirds of the import trade and more than one-half of the export trade of the whole United States is carried on, are too near the great populations of New York, Jersey City, and Brooklyn to be of any value as a protection.
>
> To provide effectual defenses would be the work of years. It would take much time to construct permanent fortifications. A small provision of the best modern guns would take several years. Neither of these works can be extemporized in presence of emergent danger. A million of soldiers, with the best equipments, on the heights surrounding the harbor of New York in our present state of preparation, or rather in our total want of preparation, would be powerless to resist a small squadron of war steamers.
>
> This state of things is discreditable to our foresight and to our prudence. . . .

Any one desiring to read this letter in its entirety may find a copy on file at the Coast Artillery Board.

The Treasury of the United States was well filled at this time and conditions in general were propitious for the rebuilding of our coast fortifications. Development work and experiments looking toward improvement in artillery materiel and methods devolved upon the Ordnance Department. This was stimulated by the activities of Coast Artillery officers throughout the service.

The necessity for taking early action towards strengthening our coast defenses and artillery in general was further brought home to the public by events that happened during the Spanish-American War. The need of a Chief to represent the interests of the Artillery in Washington was keenly felt. In 1901 the Artillery was reorganized with a separate Chief. That same year a board of officers was convened at Fort Wadsworth, New York, commonly known as the Wadsworth Board, for the purpose of devising a system of fire control. At this time there existed single batteries with fire-control equipment mostly improvised, but no forts or fire commands were equipped and organized so that the fire of several batteries or fire commands was subject to the will of

a single individual. It was the duty of this board to seek such an organization. This it did, and the report of the board was approved by the Board of Ordnance and Fortification. It was decided to have a test of the experimental system of fire control which they recommended at Fort Barrancas, Florida. The program for the test was prepared by Major (afterwards Colonel) G. N. Whistler, Coast Artillery Corps, was approved by the Board of Ordnance and Fortification in 1902 and had the approval of the Secretary of War. The test was completed in the spring of 1903, was comprehensive and very successful, and resulted in the standardization of much of the equipment that has been used since that date by the Coast Artillery. The general organization of the command remains today practically as it was there developed, although there are some changes in name. The Chief of Coast Artillery, Brigadier General Wallace F. Randolph, was ardent in his approval that some specific action should be taken to equip the coast fortifications with the necessary apparatus for fire-control purposes. The following is a quotation from his report on this subject:

> "Over-fortification is not good policy. Efficient handling of guns installed is an absolute necessity."

Report of the test was submitted to the Board of Ordnance and Fortification by the Chief of Coast Artillery. This report was adopted by that board and approved by Elihu Root, then Secretary of War. Fire-control equipment became a part of the installation of our fortifications.

In 1906 Theodore Roosevelt, then President of the United States, submitted to Congress a report of the National Coast Defense Board, commonly known as the Taft Board, and recommended that it receive generous support, which it did. This Board really brought the Endicott Board up to date and included recommendations for fire-control equipment as well as for guns and fortifications. That same year Brigadier General Arthur Murray, became Chief of Coast Artillery.

The year 1907 saw the separation of the Artillery into two branches, Field and Coast, and orders for the movement of the Submarine Mine School of Defense from Fort Totten, New York, to Fort Monroe, Virginia, where it was combined with the Coast Artillery School.

The officers of the Coast Artillery Board at this time, and until the World War, were acting in a dual capacity, either as heads of departments of the Coast Artillery School or as battery or fire commanders in the coast defenses. A study of the records of the Coast Artillery Board at this time indicates that it did much research work experimenting and testing matters pertaining to Artillery. Fire control and submarine mine equipment form an important part of these investigations.

There was a great deal of enthusiasm throughout the service for target practice. In 1907 a figure of efficiency, later referred to as a figure of merit, was adopted, and batteries were rated according to the figure they attained. A figure of merit in some form or other remained an important feature in target practice until our entrance into the World War.

The range at which the batteries fired were comparatively short. To show what was being done at this time I have taken the records given in Appendix A from the Emplacement Book of *Battery Parrott.*

Note the short ranges at which the firing was conducted. The best time was on the third practice—between 33 and 34 seconds per shot per gun. This time is considerably better than the average, and is better than the average time that is made today. You will note that then, as now, there was considerable time out. This is a serious defect in our firing and it is a question whether or not if no time out were allowed better results would not be obtained.

The dispersions of the first three and the fifth practices are given. You will observe that these dispersions are quite large in some instances.. In the best practice of all, that of November 16, 1907, attention is invited to the fact that six calibration shots immediately preceded the four record shots. Of this practice the Fire Commander, Major I. N. Lewis, Coast Artillery Corps, makes the following remark:

> The practice here recorded is worthy of special consideration. It is a most satisfactory demonstration of the probable value in service of this battery when manned by a trained, efficient personnel.
>
> It should be noted that firing in this instance was immediately preceded by three shots from each gun under practically known conditions the results of which had been accurately determined.

While these practices are good and did credit to the officers conducting them, we have nothing to fear by comparing them with some of our practices of today. Later I shall show a practice where the range was practically four times the average of these ranges using the same caliber of gun but on a different mount.

In 1911, General E. M. Weaver was appointed Chief of Coast Artillery. This officer had been one of the leaders in Coast Artillery training. He put into operation certain regulations that very definitely prescribed the rules for training and target practice. He prescribed the 30-second observing interval and required plotting and prediction to be done on the plotting board. In addition, he required time-range boards to be put up in the emplacements and used. He was very insistent on the carrying out of all safety precautions, caused the Drill Regulations to be revised, personally directing a large part of that revision. He inspected many of our forts and gave personal instruction to battery officers and plotters, causing curved courses to be plotted on the boards thereby testing the judgment of plotters in making predictions. He forbade adjustment of fire except from data gained as a result of trial shots fired at fixed points. At times this gave excellent results and at other times the result was a string of misses. On account of the restrictions imposed there was considerable unrest in the Corps. As a result of this unrest a board of officers was convened at Fort Totten, New York, to consider matters pertaining to Coast Artillery firing and target practice. Major (now Brigadier General) R. E. Callan, C. A. C., who at that time was President of the Coast Artillery

Board, was a member of the board convened at Totten. The following recommendations were adopted:

> (1) The Board is of the opinion that the present system of fire control described in Drill Regulations for Coast Artillery, 1914, as amended by Changes No. 1, and amended as recommended below, will insure efficient fire control instruction of Coast Artillery troops; that is, it is sound in principle and that it should be adhered to in principle until by actual test a better system is shown to exist. . . .
>
> (2) The Board is of the opinion that the following paragraph, in substance, should be added to the Drill Regulations for Coast Artillery, 1914:
>
> > "Whenever during the fire of seacoast guns and mortars, instrument observation from shore stations or from air or water craft shows that the use of ballistic methods has failed to place the center of impact near the target, adjustment of fire based on such instrumental observations is authorized."
>
> (3) The Board is further of the opinion that the following sentence, in substance, should be added to paragraph 8, Drill Regulations for Coast Artillery, 1914:
>
> > "When a target is first assigned, additional observations may be taken between bells, in order to reduce to a minimum the time necessary to furnish data to the emplacements for opening fire."
>
> In making the foregoing recommendations the Board is actuated by the belief that by lessening the observing interval, a certain part of the time now lost in changing targets may be saved. There are, however, other elements at work to cause loss of time, which elements are believed to be common to both the 1909 system and the 1914 system. It will require an actual trial to determine how important a part of the total loss can be saved by the change proposed.

The Chief of Coast Artillery was prepared to accept these recommendations and they became a part of our regulations.

The World War came on before instrumental observation or spotting boards made their appearance, generally, in the Coast Artillery.

At the close of the World War the Coast Artillery found itself armed with railway, tractor, and antiaircraft guns, in addition to the fixed cannon of the coast defenses and the submarine mines. These are our weapons today and it is their development with which we have been concerned since the war and with which we are now concerned.

The extreme ranges used by the navies during the World War and the ranges at which their bests ships were conducting target practice after that war brought home to us the fact that some of our cities and utilities were not protected from gun fire. Additional provisions for long-range armament and fire-control equipment were required. Then, too, it was necessary to develop proper equipment and methods of training for the railway and tractor artillery in order that these weapons could be used against naval vessels. This development was imperative as there are many places along the coast and in our foreign possessions that are not fortified and their defense will depend upon our mobile guns. Further, the assignment of those practically new weapons, the antiaircraft guns and machine guns, to the Coast Artillery gave much need for development. Likewise, the need for a proper defense against poisonous gases could not be neglected.

The conditions were somewhat similar to those that faced the Coast Artillery in 1900 except that instead of getting an increase in personnel there was a decrease in the Coast Artillery Corps.

Major General F. W. Coe had been appointed Chief of Coast Artillery in 1918. He believed that the best results would be obtained if, for a period of time at least, he left the artilleryman free to follow his own devices in this development. The following is a quotation from *Instruction of Coast Artillery Troops, 1920.*

> KINDS OF PRACTICE.—Subject to the subcaliber and service ammunition allowance, each Coast Artillery district and brigade commander, with the approval of the next higher commander, will prescribe the number and character of the firing problems for each organization under his command and will issue the necessary regulations for the proper and safe conduct of the firing.
>
> It is expected that Coast Artillery district and brigade commanders will exercise fully their initiative in and responsibility for the methods of instruction and target practice.

Some of the results of firing in 1920 were unsatisfactory but the Chief made no change in his policy except to direct that a part of the ammunition be used in a specific manner for the adjustment of fire (for further information, see an article written by Colonel W. E. Cole, C. A. C., in the COAST ARTILLERY JOURNAL for August, 1924). In the United States the very limited number of troops that were available made it extremely difficult to carry out the proper seacoast practices. Nevertheless, a great interest was manifest throughout the Corps, especially in the solution of the long-range firing problem, spotting, and adjustment of fire. In this connection I invite attention to articles in the COAST ARTILLERY JOURNAL of February, March, and May, 1924, written by Brigadier Generals Hagood, Callan, and Hatch. Brigadier General Hatch (then Colonel) was at that time President of the Coast Artillery Board.

To meet the requirements for long-range firing new guns were constructed, some of which have already been mounted, and new mounts for some of the 12-inch guns permitting long-range fire were provided. The call for better fire-control equipment for long-range firing was insistent. To answer this call, in a measure at least, charts for the range-correction board and other devices were constructed in percentages, the scales of some of the plotting boards were greatly decreased, and larger and better boards were constructed. Upon the recommendation of the Coast Artillery Board a test was made of the Ford data computer in Panama. This test was under the immediate supervision of Major Quinn Gray, C. A. C., who had been a member of the Coast Artillery Board. Unhappily, this officer was taken ill and forced to retire before the test was completed. A further test was given the instrument during the past summer at Fort Story. With the improvements which could be included in a new instrument, the Board feels that the problem of artillery fire would be much simplified if such an instrument were provided for all our batteries. By the

follow-the-pointer system the gun can be kept laid at all times. Further, the chances for making errors would be greatly reduced as the instrument would permit of considerable reduction in the personnel handling instruments upon which the data depend. It would be a great achievement if all of our guns could be equipped with Ford data computers or similar instruments and the guns laid by the follow-the-pointer system, but the Treasury is not over-flowing now as it was in the 'eighties and 'nineties of the last century. I am afraid we shall have to be content if we can obtain these instruments for our most important batteries, and even their supply for this purpose will take some time and require some careful estimating.

The long ranges at which enemy ships can bombard our harbors and the speed with which these vessels may move, taken together with the difficulties to be met in the obtaining of expensive data computors, led many officers to seek a solution for long-range fire by improving our present equipment, adding comparatively inexpensive devices. The Coast Artillery Board has done considerable work along this line. It has constructed and tested mechanical range and azimuth predictors and mechanical extrapolators, which, used in connection with the manual plotting board, range-correction board, and Stephens deflection board, permit the determination and transmission of corrected firing data to two or more widely separated guns or directing points upon a 10 to 15-second basis. This equipment has been tested using a 15-second observing and predicting interval. These devices were used at Fort Story in connection with the firing of the howitzers at that fort. The results were satisfactory. It is expected that a limited number of these devices will be constructed in the near future for further test. The Coast Artillery Board project in reference to these devices will be published in the COAST ARTILLERY JOURNAL at an early date. Lieutenant Colonel C. M. Seaman, C. A. C., and Captain E. G. Cowen, C. A. C., are mainly responsible for the development of these devices.

Attention is invited to the fact that the Ford computer predicts for the time of flight of the projectile on a tangent, while the mechanical devices devised by the board predict on the secant. Neither of these instruments permit the plotter to use his judgment in making a prediction. The fact that the plotter cannot use his judgment may in some cases prove objectionable, and this is especially true due to the long time of flight of the projectile for long-range firing, but it is doubtful if the judgment of the plotter will in the long run prove better than the instrument. In some tests that the board had, even after the plotters had been shown the course prior to plotting, they did not come as near to the true position of the setforward point as was done by the use of the devices. This question is one to think about.

An improved universal deflection board has been constructed and tested. A limited number have been constructed for service test. This board, known as the Stephens deflection board, is described in the COAST ARTILLERY JOURNAL for April, 1928. The board was used at Fort Story with good results.

To meet the needs of the mobile Coast Artillery units, as well as to standardize fire-control equipment, the Cloke board was adopted as standard in 1923. Several large-sized boards with a movable azimuth circle and for use with various scales have been constructed. One of these large-sized boards was used with good results at Fort Story during the past summer. This board with a small scale and a long base line will enable extreme ranges to be determined, provided the terrestrial observers can see the target.

In some cases the observation stations are on low sites and vision is limited, so that at extreme ranges targets cannot be observed from these stations. In such cases this limits the fire of our long-range guns. Several attempts have been made to overcome this difficulty by the use of airplanes. The Coast Artillery Board, with the assistance of the Air Service, experimented considerably along this line. Similar experiments have been conducted at several harbor defenses. Though practices have been conducted using the airplane as the only range finder, as far as accuracy was concerned these practices were not very successful. Unless terrestrial observation can be had the Coast Artillery Board believes that with the present development firing at naval targets is impracticable. Fortunately many of our important harbors permit the construction of observation stations at such heights as will enable firing at extreme ranges using terrestrial observation.

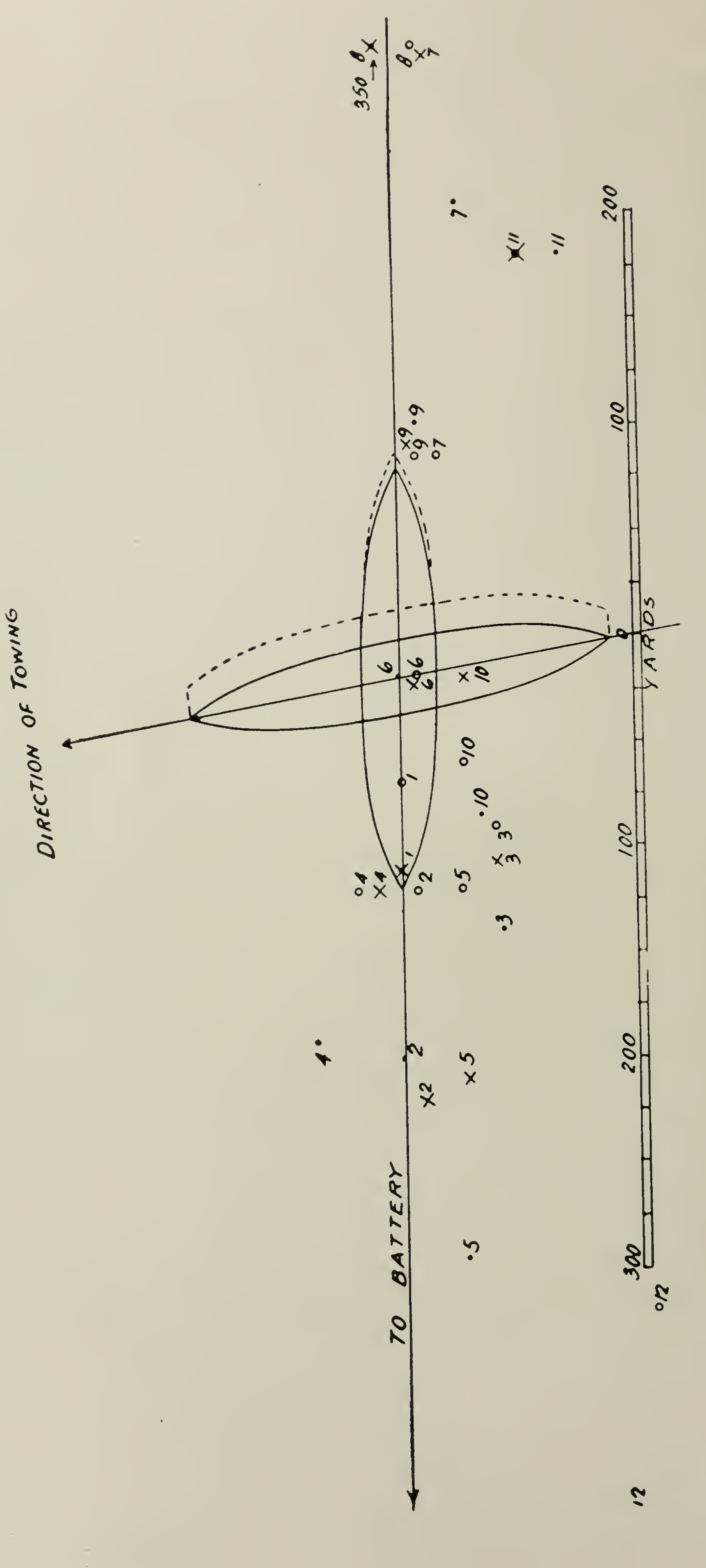
Referring again to the recommendations of the Fort Totten Board in regard to the necessity for instrumental observation of fire, it is to be noted that at the time this recommendation was made and until after the World War little attempt was made to provide equipment for locating the fall of the shots. Observation instruments were available but no satisfactory spotting board had been devised. Several boards were tested at Fort Monroe in 1923 but no standard board was adopted. Among the most promising boards used were the Gray, Hatch, and Cole; all of them had some objectionable features. The question of determining a proper spotting board is one that has been before the Coast Artillery since the war. The latest board, and one which gives considerable promise, is the Hincke Board as modified by the Coast Artillery Board. A model of this board has been made by the Coast Artillery Board and is now undergoing test. The Board feels that if the requirement that the fall of the shot must be referred to the setforward point stands a plotting board will be required for spotting; if, on the other hand, the fall of the shot may be referred to the target several of our spotting boards give good results. The question is still an open one. In this connection I wish to invite attention to the difficulties of spotting, using the small pyramidal target, to what those difficulties would be if a naval vessel were the target, and provided only the sense of the shot were required. In 1927, through the courtesy of the Naval authorities at Pearl Harbor, a naval target was secured for one practice with the 155-mm. guns at Fort Kamehameha. This target is over forty feet high and over one hundred feet in length. The range at which the target was towed when fired at was

between 7000 and 8000 yards. The rate of fire was one shot per gun every fifteen seconds. An observer near, but above, the guns equipped with a pair of good field glasses had no difficulty in calling shorts and overs. This he could not do when the pryamidal target is used. Such a method of spotting gave only the "sense" of the shot and would not be satisfactory when firing major-caliber guns at long ranges. I am confident, however, that for short ranges with rapid-fire guns such a method of spotting would give good results. The spotting problem as a whole is still under study.

With the location of the fall of the shots known, the question of adjustment of fire becomes important. It is easy to say that the center of impact should be placed on the target and kept there, but to carry this requirement into effect is not so easy. Several memoranda and training regulations were published on this subject, and it was, and is, stressed in the Coast Artillery School and in some of the schools at posts. Some devices have been constructed to assist in adjusting fire, among them the impact board and the fire-adjustment board. The Coast Artillery Board recommended the adoption of the fire-adjustment board as standard. A new *Gunnery* which covers adjustment of fire in considerable detail is in course of publication. The Coast Artillery Board co-operated with the School in its preparation.

It is not to be expected that every splash will be observed or that spotting can be depended upon in all cases. Preparation of fire is a prime necessity. Insofar as possible, correct ballistic data must be determined. A correct determination of the muzzle velocity would be a big step in advance. While the correct muzzle velocity can be determined with little difficulty at the Aberdeen Proving Ground, and with considerable trouble to a fair degree of accuracy at other places, a suitable field chronograph has not yet been found. However, this year a field chronograph called the Jeka Duma was purchased abroad. This instrument has given great promise and may solve the question of obtaining velocities in the field. Much progress has been made in the determination of the ballistic wind and atmosphere corrections, but as yet our knowledge is far from accurate. Until such knowledge is more dependable, deliberate trial fire must be used except for comparatively short ranges.

With adjustment of fire stressed, and batteries firing salvos, the necessity for calibrated guns becomes more pressing. It is manifestly impossible to adjust on the center of impact of a group of shots and get good results unless the guns of the firing battery are calibrated. Calibration of batteries will require the expenditure of considerable ammunition, at least four to six shots per gun, but the Board is of the opinion that this expenditure will be justified. Until a regular calibration fire is possible the past performance of the guns should be studied and advantage taken of the knowledge gained thereby to effect calibration corrections insofar as possible, but these means will not prove entirely satisfactory.



● Actual Point of Impact
o Reported by Airplane
x Reported by Spotting Board

Fig. 1

Mortar fire has not been satisfactory. The correct data for one zone will not furnish information on which to adjust when firing passes to another zone. This is especially true when changing from one projectile—the 1046-lb. to the other one—the 700-lb. The Board did considerable work with a view to improving accuracy of zone-to-zone firing. A range correction chart was provided. A test was held in the Harbor Defenses of Los Angeles in 1927 in accordance with a program prepared by the Board but the results were not satisfactory. Correct ballistic data for the high altitudes for the outer zones are difficult to obtain. It seems as if the problem of firing in each zone must be considered separately and trial shots fired in each of the zones. The board has recommended that this be done until some better method is found.

The Chief of Coast Artillery causes the reports of all target practices to be forwarded to Aberdeen Proving Ground for the study of ordnance experts where special attention is being given to the problem of zone-to-zone fire, and it may be that some solution will be found. The problem itself has been with the Coast Artillery for a long period of time. It is of such a nature that correct adjustments in passing from zone to zone are hardly to be expected. However, the number of shots that may be fired from mortars with the possibility of adjustment on one salvo makes the mortar a very useful weapon and one to be retained.

The use of poisonous gases in war has caused the Coast Artillery to seek some method of protection in case of a bombardment of a battery with gas shells. The Chemical Warfare Service has been consulted in this matter and gas masks have been improved for the use of observers and telephone men. In a few cases actual target practices have been conducted with the men under gas and all of them equipped with gas masks. While some of these practices have been fairly satisfactory, a better solution was sought. Gas protection for the plotting room at *Battery DeRussy* was installed and a test made. The solution as made is believed to be satisfactory and one that can be installed in all batteries. The doors and windows are securely boarded up and pure air forced into the plotting room.

I have mentioned quite a number of necessary developments, some of which have been perfected and some of which are still undergoing study, but I do not wish to be understood as feeling that with present-day armament and equipment the Coast Artillery could not give a good account of itself in any engagement against naval vessels. My opinion is quite the contrary. In the first place, battleships are no match for coast fortifications, and to silence these fortifications either a landing force or fire at extremely short range would be necessary. This has been the teaching of history, and was further evidenced by the Dardanelles campaign.

We have had some very good practices with our present equipment at both long and medium ranges. I invite attention to Fig. 1, showing a diagram of a long-range practice of *Battery Closson*.

This practice was held at Fort Kamehameha, T. H., November 18, 1926, Captain Frederick Loftquist, C. A. C., commanding. *Battery Closson* consists of two 12-inch guns mounted on barbette carriages for long-range firing. Only one gun was fired in the practice. The average range was 25,744 yards. Three trial shots were fired which fell approximately 1000 yards beyond the fixed point at which they were aimed. The target was towed by the tug *Cuba* at a speed of approximately 8 to 10 knots. The target was larger than the average pyramidal target and could be seen from three observing stations, all of which were several hundred feet in elevation. Only the smoke stack of the tug could be seen from the battery. The plotting board used was a Cloke board, scale 1500 yards to the inch. The base line was approximately 9000 yards in length. The spotting stations were near the ends of the base line. A modified Gray spotting board was used. Airplane observation was had and reports from the airplane, as well as from the terrestrial observers, were very prompt. Corrections were made as a result of the airplane spotting. An examination of the record of the fall of the shots indicates that two hits were obtained on the bow-on target and one hit on the broadside target. At that time the broadside target was the only one used. As a matter of fact one shot actually struck the small pyramidal target. An examination of the figure indicating the fall of the shots shows that excellent results were obtained. It is to be expected that such results may be obtained where excellent observation is practicable, as is the case in Oahu. The rate of fire was one shot about every 76 seconds. No attempt was made for speed as the carriage was not suited to rapid firing using Case III as it is very difficult to hear the azimuth setter who is in the well of the gun and, further, the range was so great that deliberate fire was desirable.

A study of Coast Artillery Memorandum No. 8, dated August 23, 1927—Coast Artillery Target Practice, 1926—shows quite a number of excellent practices and in some cases the rate of fire was very good. In this connection I invite attention to the night practice at Fort Kamehameha, Captain A. C. Cleveland, commanding, 12-inch disappearing carriage. The rate of fire was 37.7 seconds per shot per gun in which hits per gun per minute was .531. Also, the practice at Fort Mills, P. I., Captain A. C. Cheseldon, commanding, 12-inch barbette carriage, in which the rate of fire was 42.9 and hits per gun per minute .525. Of the small-caliber guns I invite attention to the practice of Battery Jackson at Fort Kamehameha, T. H., 6-inch guns, Captain F. F. Gallagher, commanding. Night practice: rate of fire 18.6 and hits per gun per minute 1.231. Day practice: rate of fire 14.5, hits per gun per minute 1.751. With 3-inch guns at Battery James, Manila, P. I., Captain H. G. Archibald, commanding: time to fire one round 9.6″; hits per gun per minute 5.058.

One will find, too, some very excellent practices with the 155-mm. gun. These guns can deliver fire every 15 seconds without difficulty, but they are still handicapped by the limited field of fire—60 degrees. In Panama where

the gun is semi-fixed a platform has been built enabling fire to be conducted through an arc of 180°. The question of the development of a proper mount for these guns for seacoast firing is still an open one.

I mention these practices to show what was being done in some places throughout the service in the long, medium, and short ranges, both night and day in 1926. But it was felt that there were too many practices where the rate of fire was too slow. General Hero, who became Chief of Coast Artillery in 1926, instituted the graphical analysis of target practices and adopted a figure of merit for the rating of batteries to take effect in 1927. A careful study of the records convinced him that while many of the practices were good there were quite a number in which the firing was slow and the shooting not up to the required standard. He felt that it would be better for the Coast Artillery as a whole if a figure of merit was again adopted, at least for battery record practice. As at the previous time when a figure of merit was in operation many officers were in favor of it and some were opposed to it. Those in favor of it felt that it stimulated interest in target practices. Those opposed to it felt that while it stimulated interest in target practice it did so at the expense of battle conditions. They contend that an acceptance of the figure of merit as the standard of efficiency was not correct and that officers instead of looking to development for battle would seek to get a high score. Unquestionably, there is something to be said on both sides. Those officers who contend that a high score would be the object as opposed to development were undoubtedly correct. On the other hand those who favored the figure of merit were correct in the assumption that more interest would be taken in the practices if one were adopted.

A study of 1927 practices caused the Chief of Coast Artillery to feel that the rate of fire was not properly appreciated; that there was too much time spent in the adjustment phase of the practice. Accordingly the figure of merit for the year 1928 was so written that the value of time was squared and given great prominence. While this has led to a satisfactory rate of fire as a whole, it has in some cases led to a speed mania. Practices have been conducted when the shots were falling far from the target but on account of the short length of time required for the practice no corrections could be applied. There were instances where if a target had been a hostile vessel it is doubtful if those on board would have known they were under fire. Yet a good score resulted. Curiously enough, too, often a large DAPE resulted in a good score even though the hits were few, and a small DAPE with a greater number of hits would give a less score. Such a condition was manifestly wrong. These conditions led to a revamping of the figure of merit, and during the past few months the Coast Artillery Board and the Coast Artillery School have revised the score and submitted it to the Chief of Coast Artillery. It has, in the main, been adopted. It is the expectation of the board that this score will more nearly equalize the comparative value of hits, time, and accuracy. It cannot be expected, however,

that any figure of merit where only a few shots are fired as must be the case with our limited amount of ammunition, can give a correct measure of the efficiency of a battery. It is believed that with the new figure of merit that good practices will get good scores and poor practices will get poor ones. It is not to be expected that the best battery will always get the best score. The question of chance is bound to enter, but the captain who has a well-trained battery will have the dice loaded in his favor. At the present time it should be noted that there is no rating of batteries for the preliminary practice and none for battle practice; the former gives the battery commander leeway in preparation for record fire, the latter requires the fort and group commanders to exercise their normal functions and permits, insofar as practicable, an assumption of battle conditions. Battle practice should result in the development of a system of concentrating fire on a single target or dispersing the fire as the tactical situation may warrant at the same time requiring, insofar as possible, the adjustment of the fire of each battery separately. This will require careful timing of salvos or the use of colored splashes.

In connection with the matter of rating batteries, it is interesting to note that from the development from 1900 to 1907, a period of seven years, there was no figure of merit. Similarly, the development from 1920 to 1927, there was no figure of merit. But when the development had proceeded for a certain time there was a call for a figure of merit in both instances.

The development of antiaircraft artillery presented a difficult and pressing problem for solution. During the World War guns, mounts, and fire-control equipment were hastily provided; the 75-mm. gun was the principal weapon. A new 3-inch gun was designed but before it was available the armistice was signed. This gun was finally completed and some placed in the hands of troops. A newer model, 1928 MI, embracing many improvements has been constructed and is now undergoing test at Aberdeen. This gun is admirably designed, has a high muzzle velocity, and is very mobile. It is a most satisfactory weapon, capable of firing 25 rounds per minute. Another gun, the 105-mm., is now being tested at Aberdeen Proving Ground. This gun is on a fixed mount, shoots a projectile weighing 33 pounds, and can be fired at the rate of 15 shots per gun per second.

Two data computers or directors, the Vickers and the Wilson-Sperry, are undergoing test at Aberdeen Proving Ground. Both of these instruments are great improvements over the RA corrector now in the service, but which will ultimately prove to be the better is yet to be determined. The Vickers makes no corrections except for wind; other corrections can be put in as spotting corrections. The Wilson-Sperry instrument will calculate all ballistic corrections and apply them to data sent to the guns.

To determine the altitude, an element of data which must be put into a computer, a height finder of some kind must be used. Several coincidence and

stereoscopic instruments are being tested at Aberdeen Proving Ground with the expectation that one of them will be selected. One of the advantages of the new system is that the men following the target are close together, making it much easier to put observers on the same target. Dead time has been eliminated, data being transmitted electrically to the guns and the results indicated by pointers and dials. The traversing and elevating details watch the pointers and can keep the data continually set. The same is done on the fuze setter, the setting of which is automatic and continuous. The data computer needs to predict for time of flight only. Another development is the torque amplifier which permits the guns to be laid by the data computer without the aid of traversing and elevating details at the guns.

Searchlights and sound locators have been the subject of much experimental work, with the result that now both have been much improved. The old 36-inch light and Mack truck have now given way to the 60-inch barrel light and Cadillac power unit.

There are two types of new lights, one of 150 amperes, the other of 250 amperes. The main difference in the two is the increased average of illumination given by the 250- ampere light.

The type of sound locator now used is still the exponential horn, but corrections for sound lag and other conditions may now be applied automatically as is the case in gun fire. Furthermore, the data from the horns are received at an instrument known as a comparator. Here the operator matches his pointer with the one actuated by the horn and so moves the light. This permits of distant operation of the searchlight, thus keeping the operator from being blinded by his own beam. Sound locators are to be carried in specially designed vehicles so that the whole unit, lights and locators, would be able to make from 30 to 35 miles an hour on good roads.

Automatic guns have come in for much development since the war. The .30-caliber machine gun has been improved. However, the principal effort along the small calibers has been put into the development of the .50-caliber gun. This piece was used in the World War as an anti-tank gun and when used for antiaircraft work gave great trouble. There was no suitable tripod, no good cooling system; the gun itself functioned very badly under sustained fire and there were no suitable sights on hand. This piece has now been put into excellent condition. It will deliver 500 rounds per minute. Its accessories, such as tripod, cooling system, flash hider, and others, are all now in satisfactory condition. For long-range work data computers have been provided so that the whole platoon of four guns can function as a gun battery or as four free guns. This whole installation has been built from the ground up since the World War.

Experiments have been conducted so that four guns can be mounted and fired from the same mount. This system is called the multiple mount and gives

great promise for the future though at present no such mounting is in final form.

Along the development of lighter calibers was the building of a battery of 37-mm. guns. These are full automatic guns designed for a muzzle velocity of 3000 f. s., and firing a 1¼-pound shell at the rate of 100 rounds per minute. This is a mobile piece that can be emplaced in 3½ minutes and can be pulled over almost any sort of ground. It is controlled by a data computer as is a gun battery. This weapon is supplementary to the 3-inch gun and the .50-caliber machine gun.

With the new towing vehicles in operation, such as the Coleman truck and others, it is possible to take any of the mobile pieces I have referred to over very rough ground, units are not restricted to roads.

Major J. D. McCain, C. A. C., a member of the Coast Artillery Board has been in general charge of the antiaircraft development at Aberdeen Proving Ground this year. A battalion of the 62nd Coast Artillery has been temporarily at that station. Major McCain is very enthusiastic over what is being done and feels that the results more than justify the time and labor spent. This development will continue for some time to come.

With reference to antiaircraft artillery target practice, it has been but a few years since firing at a moving target was considered possible. Since that time a great deal of advance has taken place. It is realized that the scores cannot be called a true measure of the accuracy of the firing largely on account of the difficulty of spotting and earmarking the shots. At the Coast Artillery Board we have upon the wall scores of various antiaircraft batteries. It is interesting to hear the remarks of the various officers in looking over these scores. Such comments as "not true," "that can't be done," and "I don't believe it," are often heard. The development of a camera to facilitate spotting is in progress due largely to the efforts of Captain A. M. Jackson, C. A. C. Results of the Aberdeen tests indicate that the score computed when the camera is used approximates one-half the score when spotting is done by ordinary methods. Undoubtedly the use of the camera would have reduced several high scores that have been figured in the past. It is expected that this camera will ultimately become an article of standard issue since the results obtained with it are beyond a doubt correct.

With reference to the Coast Artillery Corps as a whole I feel that it has made as much real development during the past eight years as it has made in any like period of time in its history, and it has done this in spite of the very limited personnel which has been assigned to it. When the records of the past and present are examined and hazy memories thrown in the discard, no fear of comparison with the past need be felt by officers of the present day.

In conclusion I wish to add that the Coast Artillery Board is anxious to receive suggestions from the Coast Artillery officers throughout the service. In that way only can we keep abreast of the times.

APPENDIX A

Battery Parrott, Fort Monroe, Virginia

Date	Organization	Battery Commander	TS	RS	Hits	Mean Range (RS)	Elapsed Time m s	Time Out m s	Corrected Time m s	Remarks
x 5-14-07	35 Co.	C. E. Kilbourne	3	6	1	6875	5 07⅖	1 59	3 08⅖	Test and exhibition for General Kuroki. Order: 5, 3, 5, 3, 5, 3.
x 7-10-07	35 Co.	C. E. Kilbourne	3	6	2	7361	7 13	3 55	3 18	Only 1 shot fr No. 3 piece. T Speed 6.8 m. h. Order: 5, 5, 3, 5, 5, 5.
x 11-16-07	35 Co.	C. E. Kilbourne	6	4	4	6041	1 33	0 24	1 09	6 shots calibration, 4 record shots. T Speed 5.5 m. h. Order 5, 3, 5, 3.
7-13-08	166 Co.	R. M. Mitchell	3	6	2	5407.5	12 45	6 54	5 46½	Excess time eposure 5½ sec. Student officers' practice. T Speed 6.1 m. h.
10-21-08	166 Co.	R. H. Williams	4							Stationary target. Proof firing No. 3.
x 10-30-08	166 Co.	R. H. Williams	3	6	0	6833	6 25	1 52	4 33	Trouble with ramming. T. S. 16.2 m. h.
11-3-08	166 Co.	R. H. Williams	3	4	0	6705	10 19	7 07	3 11	Same trouble. T Speed 6.8 m. h.
7-2-09	166 Co.	R. H. Williams	3	6	3	4381		15 20	4 18⅖	T Speed 4.43 m. h.
7-20-09	166 Co.	John M. Dunn	3	6	4	4600		00	6 03	Student Officers'. T Speed 5.1 m. h.

X Dispersions—target practices of 5-14-07, 7-10-07, 11-16-07, and 10-30-08.

5-14-07		7-10-07		11-16-07	10-30-08
+133	18 L	0	16 L (Hit)	4 Record Shots. All hits	—108 All good for direction
— 37	3 L (Hit)	—132	0		—300
—700	8 L	0	0 (Hit)		—300
—189	17 L	—147	6.5 R		—168
+ 95	12 L	—400	0		—324
—217	11 L	—173	0		—324
C. I. — 154 1-3		C. I. — 142			C. I.—259

Message Center Operation for Rapid-Fire Mobile Artillery

By Staff Sergt. Paul C. Doster, 55th C. A.

Foreword

ONE of the most important factors in reducing the time between orders for fire and the actual firing is the transmission of messages through the message center. A period of time ranging from thirty seconds to three minutes may be lost in the message center in recording and transmitting messages concerning fire. On the other hand, with the message center properly operated, messages may be transmitted, record made, and the firing started with no delay whatever in the message center.

It has been the experience of the writer through several years of duty as chief of message center for mobile artillery regiments that the present system of message center operation, as outlined in the message center manual issued by the War Department, is not sufficiently flexible to permit operation under high pressure, with messages being transmitted at the rate of from sixty to ninety an hour. It is not, therefore, suitable for use by mobile artillery where saving of time is essential and where seconds actually count for as much as minutes.

There are two prime requisites for an efficient message center under the present operation system: (1) Correct transmission of message; (2) An accurate and complete record of each message, showing time of receipt and time of dispatch.

There cannot be too much importance placed upon the speed of transmission of messages through the message center. By slow operation it is not only possible to delay the fire of an entire regiment of rapid fire guns of great effectiveness, but it is probable that such will be the case. An example of this slowing up follows:

A battalion of 155-mm. guns, consisting of three batteries of four guns each, is in position along the shore with an interval of one mile between batteries. The directrix of the batteries being approximately the same, the field of fire for the entire battalion will be approximately 15,000 yards, or eight miles wide, at a range of ten thousand yards to twelve thousand yards. A squadron of light cruisers, traveling left to right at a speed of 30 knots, or approximately 34 miles an hour, enters the field of fire at a range of 12,000 yards from the first battery and proceeds full speed ahead straight across the field of fire laying a smoke screen or firing on the shore batteries. The targets will, therefore, remain in the field of fire for a period of approximately fourteen minutes. Assuming that one battery will fire at a time, there will be time for approximately 216 rounds on the basis of each battery firing at fifteen-second intervals for four and one-half minutes. This is taking for granted that the batteries

are ready to fire the moment the targets enter the field of fire and assuming that orders have been transmitted through the message center with no delay. However, if there is a delay of six minutes in the message center, which is a small margin of delay under the present system of message center operation, the battalion can only fire 120 rounds, which lessens by almost half the effective-

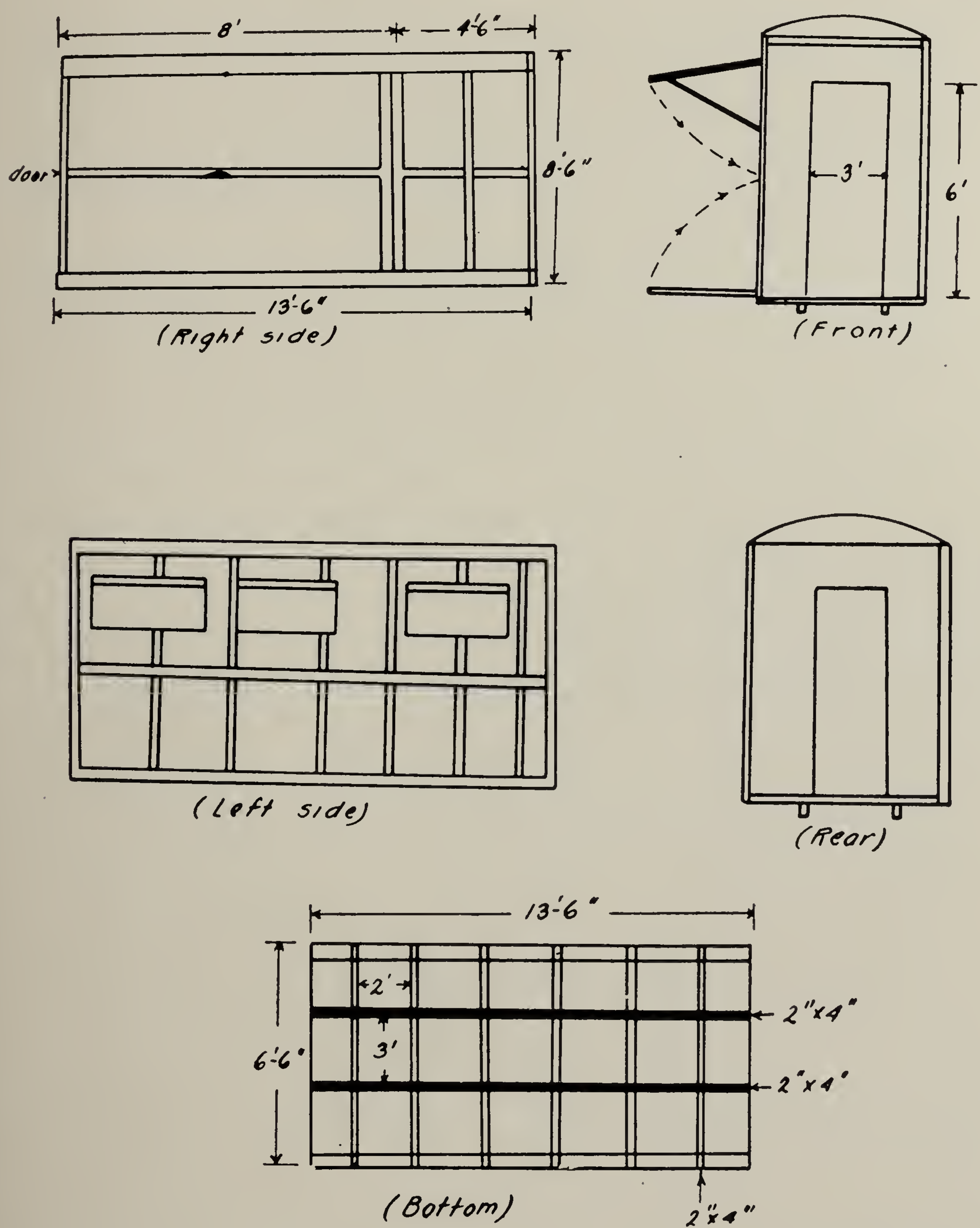


Fig. 1. Message Center Trailer (Outside)

ness of the battalion. Thus it can be seen that delay in message and order transmission has cost the battalion 96 rounds, and since it is a surety that a cruiser being fired upon by a shore battery at full speed and with its greatest effectiveness cannot accurately return this fire, the delay in message transmission might permit the cruisers to fire upon our batteries without interruption for a period of six minutes, which is a long time in rapid-fire organizations and might occasion the useless sacrifice of many lives.

The writer has, after much experiment with various methods of message center operation, succeeded in cutting down time for transmission to an almost negligible number of seconds. An example of the flexibility of this system of operation and its advantage over the old system is apparent below. The messages marked *n* were messages transmitted under this system by somewhat inexperienced personnel. The messages marked *o* were the system now in use as outlined by War Department *Manual on Message Center Operation* (these messages were under simulated war).

(*n*) 5:32 AM Destroyer squadron reported by Battery B.
(*n*) 5:33 AM Group commander had been notified by phone and message center chief ordered to notify higher headquarters and request orders to fire.
(*n*) 5:33.5 AM Higher headquarters notified, orders requested.
(*o*) 5:39 AM Message from higher headquarters with orders to open fire.
(*n*) 5:39.5 AM Group commander had orders and ordered B Battery to open fire.
(*n*) 5:40 AM Battery B reported that it had opened fire.

By analyzing the above it will be seen that the entire function of the message center operated under this system required three minutes, while the transmission of one message alone under the War Department system required over three minutes, assuming that the higher authority consumed one and one-half minutes in giving the verbal order to open fire. This delay of three minutes enabled the destroyers to travel over a mile unmolested and sacrificed approximately 48 rounds which might have been fired at them by Battery B.

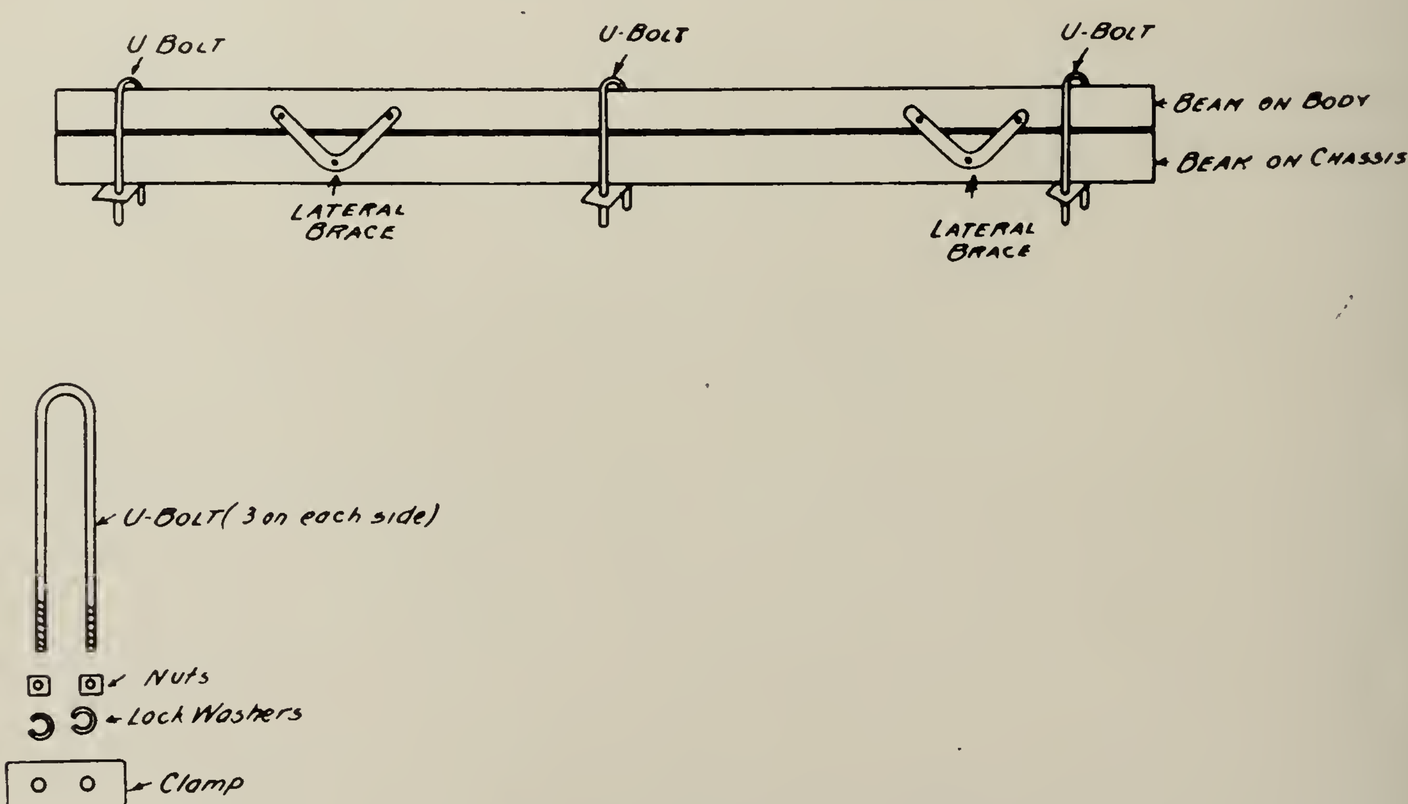


Fig. 2. Method of Attaching Body to Chassis

The Mobile Message Center Trailer

1. *Use.* The mobile message center is primarily for a mobile regiment of artillery, although it may be adapted to the requirements of any group or groupment requiring a message center which must be moved from place to

place. As the fixtures within this message center are permanent and the switchboard is a permanent installation, the time of connecting up and disconnecting is limited only by the speed with which the wire men lay wires to the different communication points and attach to the permanent terminals at the message center. Thus it can be moved from place to place as required with very little loss of time and with comparative ease. Its usefulness as a time saver is obvious, as within ten minutes after arrival at the end of the wires the message center can be connected and in operation.

2. *Construction.* The principal parts of the message center trailer are—

a. The trailer chassis. This is a four-wheeled chassis with towing tongue for connection to either a truck or a tractor. The wheel base is 135 inches and the width of the chassis is the same as the standard trailer. (The chassis now used for chart-room trailers is ideal for this purpose.)

b. The body (see Fig. 1). The body of the message center trailer with which these experiments were conducted was adapted from the body of a chart-room trailer issued for use by the air service and found on the post. The details of alterations to this body may be seen by studying the drawing of the completed trailer (Fig. 1). All dimensions are given on the drawing. The body is clamped to the chassis by use of U-bolts, three to each side, and the use of angle-iron braces to give rigidity and prevent slippage. The method of attaching body to chassis is shown in Fig. 2 herewith. Any suitable metal available may be used for these U-bolts providing it has a tensile strength of at least one ton. The angle-iron braces are placed so as to prevent lateral play and assume rigidity of the trailer body.

The interior of the trailer body is constructed as shown in Fig. 3 herewith. The fittings required are:

- 1 Built-in table, 8′ x 30″.
- 1 Field switchboard installation.
- 1 Stand for field desk.
- 4 Mess stools (permanently secured to floor).
- 15′ Lighting installation.
- 2 Field telephone units permanently attached to table.
- 2 Attachments for fixing typewriters to table.

The equipment for the trailer is:

- 1 Complete field switchboard units (constructed as shown in Fig. 4 herewith).
- 2 Field telephones (1 with headset and 1 with handset).
- 2 Typewriters.
- 2 Lamps, Coleman or electric.
- 1 Field desk, regimental, containing supplies for clerical work and message center blank forms.

3. *Method of Transporting.* After experiments conducted to determine the best method of transportation of the message center trailer, it was decided that having it towed by a 5-ton tractor was the most suitable method under conditions existing at experimental station. It was found that towing this trailer behind a truck or other vehicle which moves at a rate of speed of ten miles per hour or over was impracticable due to the fact that the trailer would not

follow the truck without whipping from side to side on the road and thus endangering passing vehicles. However, at any rate of speed less than ten miles per hour, the trailer can be maneuvered without difficulty and on the road is very easy to handle. This method of transportation is considered superior to towing by truck as the tractor can tow the trailer to places not accessible by truck and can therefore render it easier to camouflage and enable placing it in more advantageous positions. The loss in speed in moving from place to place is negligible, as the 5-ton tractor has a road speed in excess of

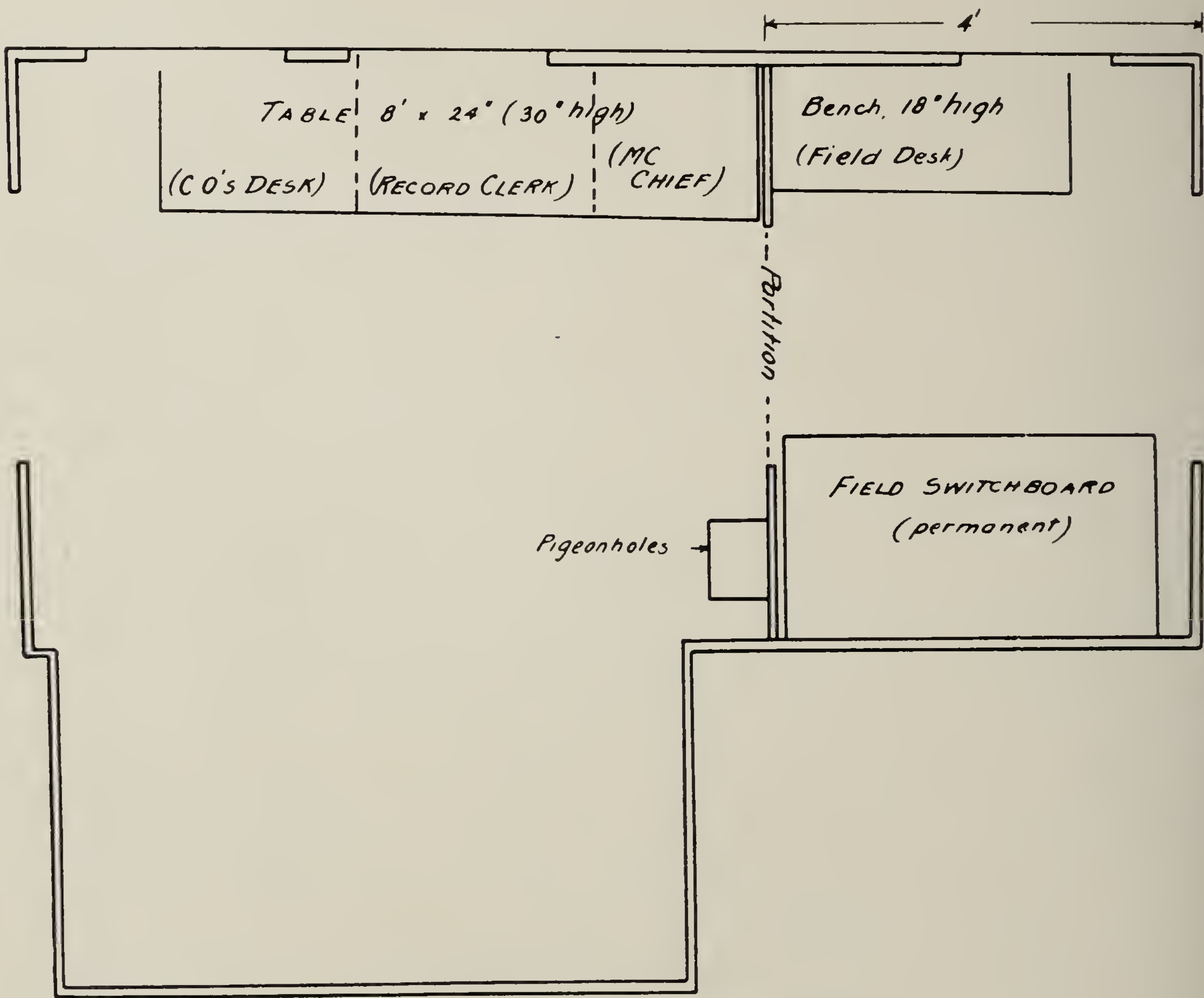


Fig. 3. Floor Plan and Arrangement (Interior)

those required to move the guns of the regiment conducting the experiment and the trailer can be sent ahead of the heavy columns of the regiment and be in position for connecting up by the time the batteries get to their positions. The speed and apatability of the 5-ton tractor is such as to make it an ideal vehicle for towing this trailer. The experiments were conducted over macadamized roads and cross-country roads that included almost every condition to be expected in field maneuvers. It was therefore decided to use the tractor for this purpose.

Personnel

1. *Personnel Requirements.* In reducing the number of men required for the efficient operation of the mobile message center this type of message transmission not only releases for other duties men who must under the present

system stay in the message center, but it materially reduces the probability of errors. There are only four men required for efficient operation of the entire message group. Three of these men are on duty in the message center proper and the fourth is a radio operator and visual signalman. The fact must be borne in mind that the three men who operate the message center, and alternates for them, must be men of unexcitable temperaments. The ability of each man in the message center to remain calm under the highest pressure often makes for success or failure of the message center. It has been the experience of the writer during the past two years of experimenting that a young soldier which is a graduate of high school is a better man for the message center than the so-called "old soldier" with a sketchy grammar school education. There are several general requirements for every member of the message center detail:

(a) Ability to make quick decisions.

(b) Clear enunciation and of sufficient education to assure good composition and the use of brief and precise speech over the telephone.

(c) Ability to speak slowly and clearly without changing the tone of voice.

(d) Ability to talk over a telephone.

In the message center proper the following personnel is required, and their general qualifications for the work should be as listed below:

a. Message Center Chief. It has been found that a sergeant major who is a stenographer and who has had some experience in administration is better fitted for this detail than the ordinary typist. At any rate he should be a noncommissioned officer of the grade of sergeant or higher.

(1) Typist with speed of sixty words a minute or more.

(2) Noncommissioned officer of sufficient authority to exercise supervision over communications if necessary.

(3) An excellent education. (High school graduate or better.)

b. Records Clerk. Under this system the records clerk is also the code clerk, and during times of emergency should be able to send and receive visual signals. He should be a man who is painstaking in detail work and who can be depended upon to overlook nothing in the making of records.

(1) Typist with fair speed.

(2) Familiarity with all message center forms and their uses.

(3) Good education.

(4) Familiarity with codes in use in message center and ability to encode and decode rapidly.

(5) A working knowledge of sending and receiving of visual signals.

c. Switchboard Operator. This man should be a man of sufficient experience with the service type of field switchboard to assure that he will not make mistakes in connections. He is also available in emergency as a visual signalman.

(1) Thorough knowledge of the operation and care of his switchboard.

(2) Ability to make minor repairs to telephone equipment and lines.

(3) Working knowledge of sending and receiving of visual signals.

There is a fourth man who is normally considered a part of the message center. He is the radio operator, and due to the fact that most mobile units have their own radio truck, his station will no doubt be away from the message center. Upon this man depends to a great extent the maintainence of communications in case the land lines fail. He should, therefore, be primarily a radio operator and visual signalman. In case radio and land lines fail, he, with the records clerk and switchboard operator from the message center proper, may keep up communications by means of the various forms of visual signalling. As a general rule, the radio operator with Coast Artillery regiments is a specially trained man who is qualified to perform these duties.

2. *Training.* The training of all units is primarily for bringing them to such proficiency that they can either function efficiently in action or can instruct others properly. The training of the personnel for the message center unit may be carried on in conjunction with drills which are regularly scheduled. With the mobile message center trailer, it is an easy matter for the message center to be hooked up with the firing batteries and the various communication terminals and function at routine drills in the same manner as it would function in the field. For drill purposes the three members of the message center detail may be relieved by their alternates from time to time to assure all members of the detail a proper working knowledge of their duties and the ability to perform them rapidly and efficiently. A drill set-up which is being used at the present time by one regiment of mobile artillery has been found very satisfactory for this training in that it both trains the message center detail and furnishes the group commander with a record of action during the drill. A diagram showing this set-up follows:

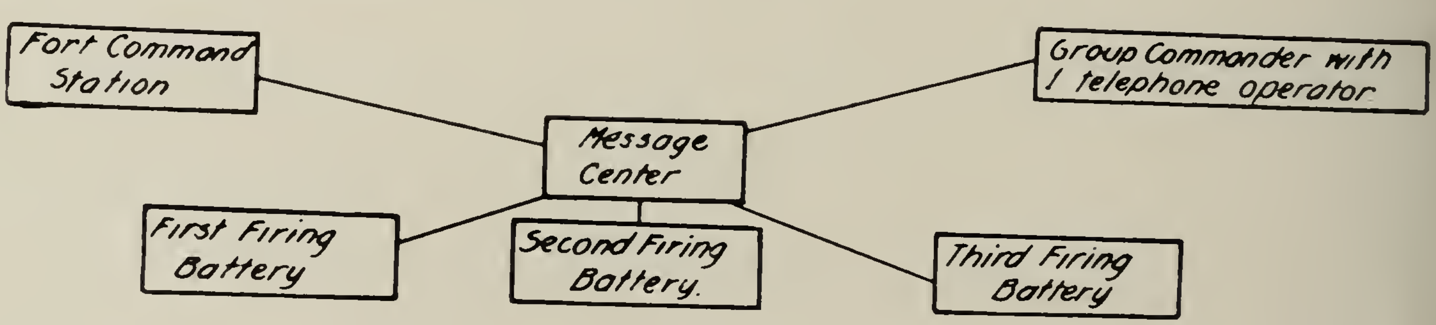


Fig. 4

In this case the message center has been parked at a point about a hundred yards from the firing batteries and all drill is carried on under field conditions. It is obvious that the training of the message center should receive just as much consideration as the training of the other units of a command as upon the message center depends a great deal of the work of coordinating these units. A firing battery in most cases must communicate with higher headquarters through the message center, and the message center detail must be competent to send messages through promptly and accurately.

The selection of men for this detail has great bearing upon the training. Unless the best personnel available is used it is useless to endeavor to secure proper operation of the message center. This is true both in using the old

system and the present one. As a rule the writer has observed that commanding officers responsible for training personnel for message center operation are prone to place upon that detail men who are not suitable for other work. In other words, if a man is a good telephone repairman the battery commander will ordinarily place him upon repair work rather than train a man for that duty, and place some man who can easily be trained as a repair man on message center duty when he may be unsuitable for that work.

3. *Duties.* In a brief way, the following outline gives the duties of the various members of the message center detail:

a. Message Center Chief:

(1) To receive, transmit, and record on a rough log sheet all messages coming through the message center.

(2) To classify these messages as they come in and decide upon the order in which they will be dispatched.

(3) To decide whether or not messages will form a part of the permanent message center record.

(4) To supervise the operation of the message center and make sure that proper records are being kept.

(5) In times of speedy transmission, to exercise constant control over all messages and route them through in proper sequence according to importance.

b. Records Clerk:

(1) To assist the message center chief in the receipt and transmission of messages.

(2) To make proper form messages from rough log and include in permanent records.

(3) To be in charge of the records of the message center at all times and to keep those records up to date.

(4) To encode and decode messages rapidly and accurately as required.

(5) To have a working knowledge of visual signalling and in time of emergency be able to send and receive by means of visual signals.

c. Switchboard Operator:

(1) To give prompt and accurate connections when called for.

(2) To repair all minor breaks in his switchboards and telephone in the message center.

(3) To be able to connect quickly all telephones on his board so that all telephones are direct connected and the conversations may be overheard by the message center chief.

General Operation

1. *Routine of Operation.* All military messages are divided into three classes. They are—

a. RXmessages. These messages are classified as *RUSH* and take precedence over any other message on the line except other rush messages. If lines are being used for the transmission of other messages and a rush message is

announced, the lines will be cleared immediately. When two or more rush messages are coming through simultaneously they must be handled in order of importance, except in the case of firing orders or assignments of targets which take precedence over all messages.

b. P messages. This classification is "Priority," and includes all messages reporting on action, observers' reports, and other messages not of a routine nature but not of sufficient importance to be classified as rush.

c. OD messages. Ordinary messages concerning routine administration and supply are classed as OD. They will not be sent over the lines while the lines are being used for other work, but will be sent during odd times.

In addition to the three classes above, there are "Personal" messages, that is, messages from person to person concerning affairs other than the action at hand. They will not be routed over the wires if required for anything else.

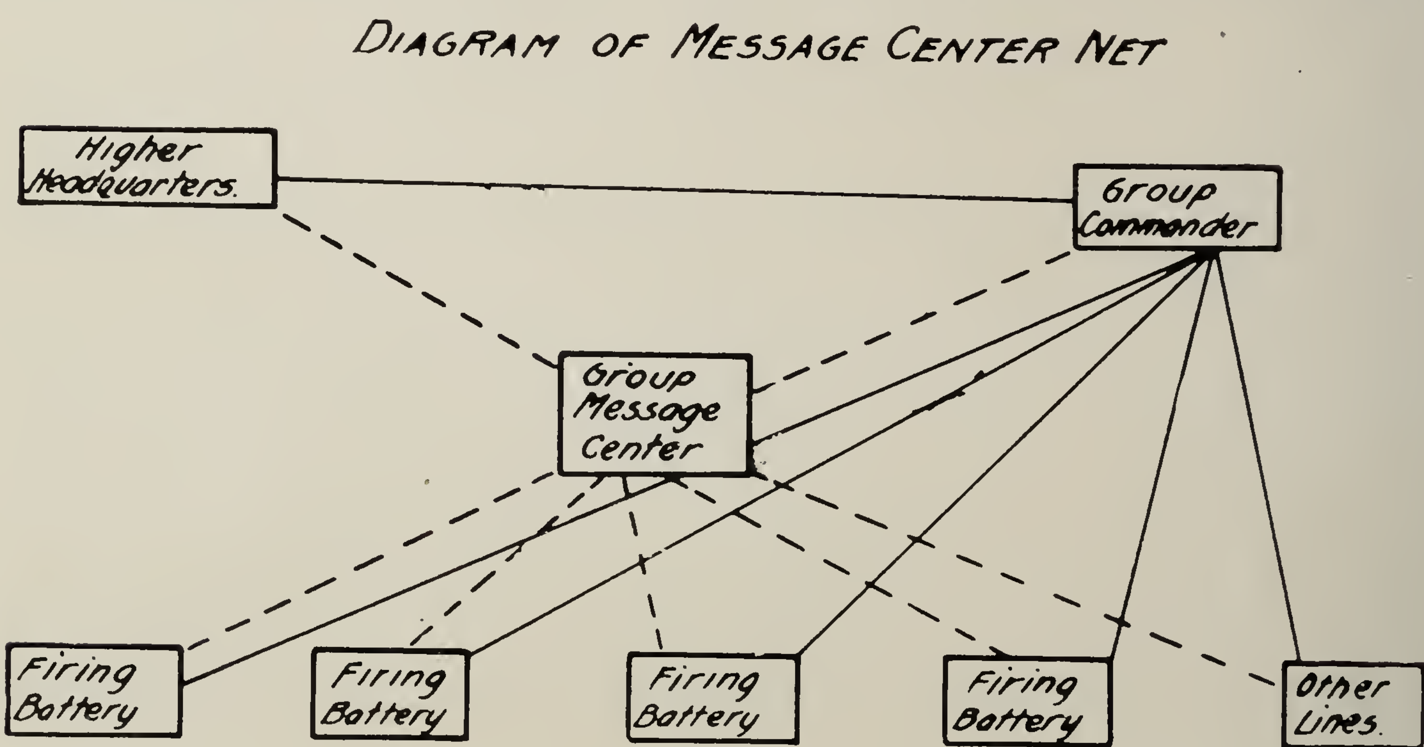


FIG. 5

In the matter of priority of messages it must be borne in mind that all command lines have priority over other lines and messages coming over these lines have priority over messages over any other lines. These command lines are:

a. Higher commands to your command.

b. From your headquarters to your organizations and units.

c. Staff departments to message center.

d. Battery lines to message center.

e. Lines between subordinate commanders and their stations, such as the line from a battery command station to his observation post. These lines do not ordinarily pass through the message center.

The command net, insofar as the message center is concerned, is illustrated in Fig. 5 and these lines have priority over every other line. Solid lines as shown are command lines. Broken lines are lines over which is possible for persons to hold direct conversation through the message center chief's telephone. By a glance at this diagram one may readily see that the direct transmission of messages from senders to receivers, with the message center chief making a record of the message as it goes through, is easy of accomplishment:

A message comes into the message center. The switchboard operator immediately puts the call upon the phone of the message center chief who receives the message. As the message comes in, the message center chief types it on a sheet known as the "rough log." First, he types the message center number and the time; second, the person or organization for whom the message is intended, followed by message classification; third, the body of the message; fourth, the signature; and immediately following the signature he shows sender, receiver, time of receipt, whether or not the message shall become a part of the permanent record, and whether a confirmation will be sent. An example of an incoming message as it is written down on the rough log follows:

14. 530pm (This being the message center number and time.)
CO Gun Group 3 Ewa Sector RX (Meaning that the message is intended for the Commanding Officer, Gun Group 3, and is classified as RUSH.)
HDPH11. (The sender's message center number.) When will you be ready for action?
Riley Jones Smith 532pm Phoned Major Roe 534pm XC

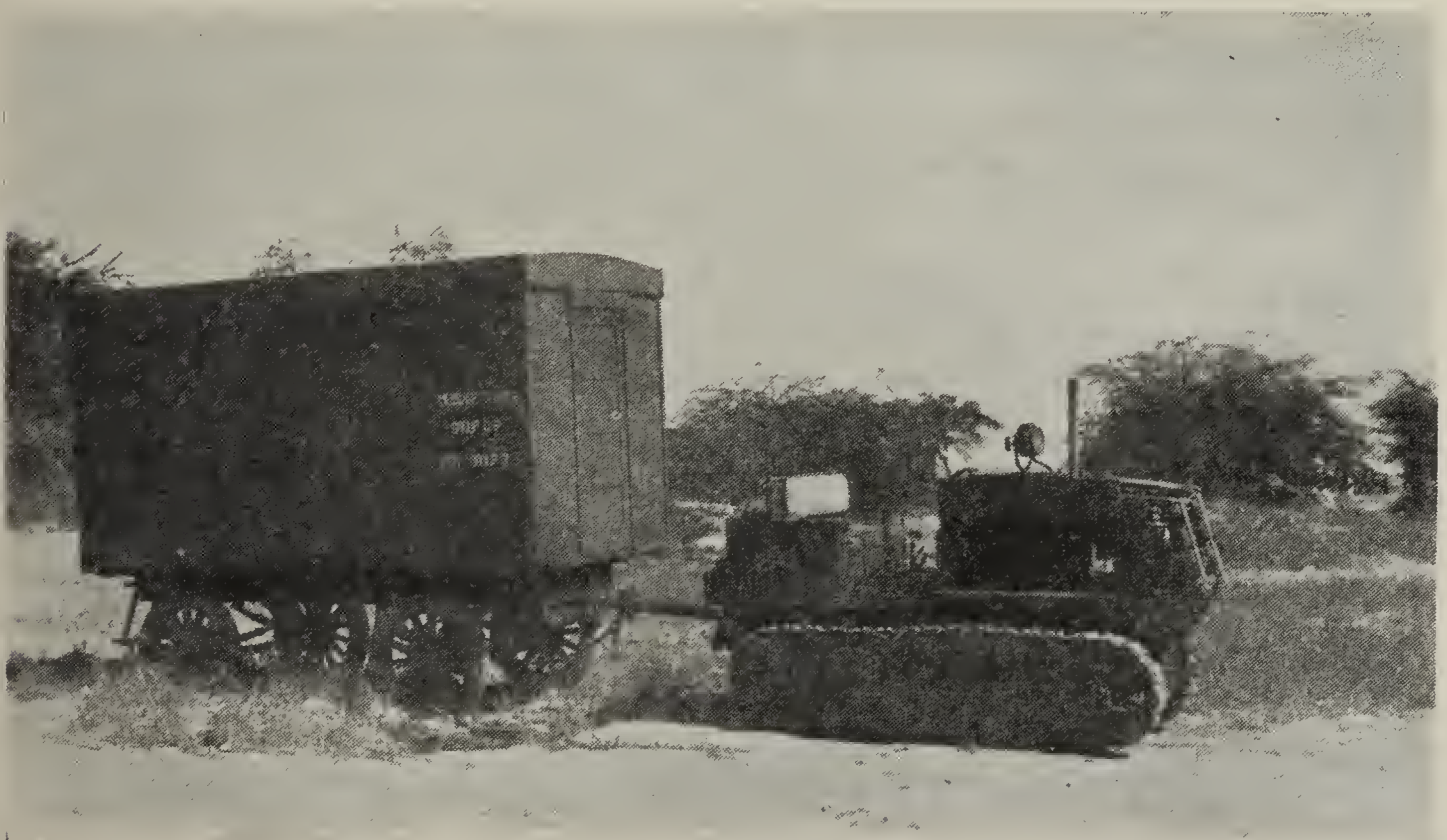


FIG. 6

The message center chief immediately transmits this message to the commanding officer. If it is necessary that it form a part of the permanent record of the message center, the message center chief so indicates by an x at the right of the page even with the last line, and if it is desired to send a confirmation copy to the addressee, the letter C after the X will show that such action is to be taken by the records clerk. Thus, the last line of the foregoing message, as written on the rough log by the message center chief, would read:

Riley Jones Smith 532pm Phoned Major Roe 534 pm XC

It will be assumed that the Commanding Officer's telephone rings in on the Message Center Chief and the Commanding Officer directs him to inform HDPH

that Gun Group 3 will be ready for action at 6:15 p. m. The message center chief immediately calls HDPH and as he writes the message on the rough log, he transmits it to the addressee. It will be assumed that the Commanding Officer spoke to the Message Center Chief at 5:37 p. m. Thus the message will appear on the rough log as follows:

538pm
HDPH RX
Gun Group 3 will be ready for action at 6:15 pm.
CO Gun Group 3 Smith Jones 540pm XC

In that manner the rough log will contain all data regarding the first message and the reply thereto, and will appear as follows:

14. 530pm
CO Gun Group 3 Ewa Sector RX
When will you be ready for action?
Riley Jones Smith 532pm Phones Major Roe 534pm XC

Fig. 7

15. 538pm
CO HDPH RX
Gun Group 3 will be ready for action at 6:15 pm.
CO Gun Group 3 Smith Jones 540pm XC

It is assumed that all messages are sent over the phone. In case telephone communications go out of commission notation will be made as to method of sending message. Assuming that the telephones were out and the message was sent over radio, the last line would then appear:

CO Gun Group 3 Smith Jones 540 pm Radio XC

The message center chief is then ready for the next transmission, has transmitted the first message and the reply thereto, and has included in his rough sheet all data necessary for making an accurate record of the matter.

As the message center chief completes a page of the rough log, he passes it to the records clerk who immediately reads *every* message on the sheet. He looks particularly for those marked *X* or *C*. When he finds one marked *X*, he immediately places the proper message forms in his typewriter and makes a finished message therefrom. He makes an original and one carbon. The original he places in the message center file and the carbon he places aside to be sent in with the war diary.

In case the message is marked *C*, the records clerk makes one additional carbon copy of the finished message and either dispatches it by messenger to the addressee or places it in the proper pigeonhole for distribution.

In this manner the message center register is eliminated, as the rough log will give all data necessary about any message that passes through the message center. The only message form that will be required is the standard type of form used for messages and these may be mimeographed.

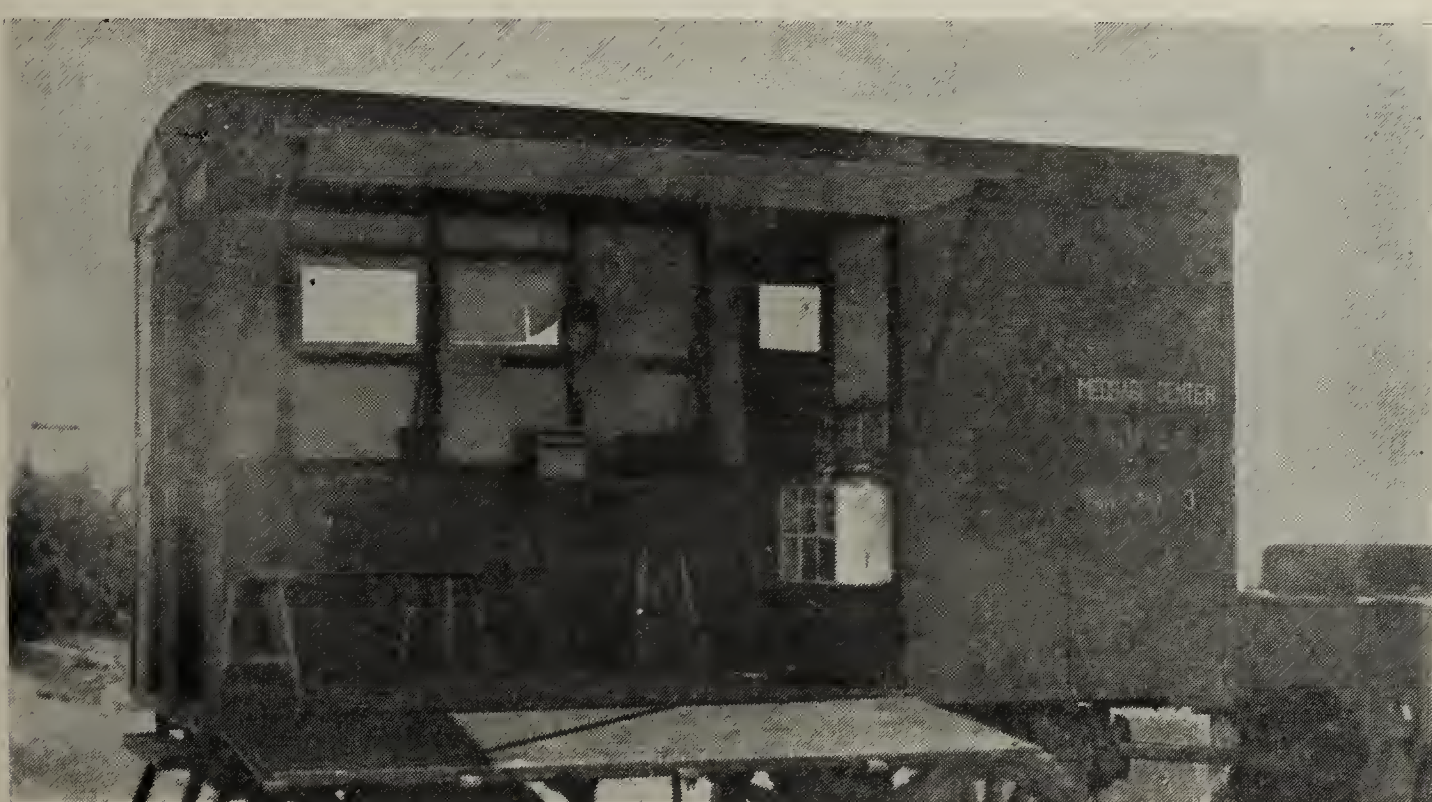


Fig. 8

Operation Under Ordinary Conditions

In speaking of "ordinary conditions" it is assumed that one means the time in the operation of the message center when messages are coming through at the rate rate of about fifteen an hour or less. Under such a condition the operation of the message center will present no difficulty, and what is now the highest speed of the War Department method of message center transmission becomes a very low speed of work for the mobile system.

The messages are handled in the manner outlined in the foregoing pages, and each call to the message center is answered by the switchboard operator and placed on the message center chief's telephone, while the message center chief calls for each separate connection as he desires it. For instance, Battery A sends a message to the commanding officer. It will come into the message center, be recorded as it comes in, and after its receipt the chief of message

center dispatches it to the commanding officer, making at the same time a record thereof. Operation in this manner is a leisurely affair with everyone having an abundance of time in which to perform his duties.

Operation at ordinary speeds up to fifteen messages an hour should present no difficulty even to untrained personnel only partially familiar with the function of the message center. It can even be done by writing each message out in longhand.

Operation Under High Pressure

At times during the operations of every mobile unit there comes a period of extreme rush, when every person is working at top speed and every facility for efficient action is worked to capacity. At these times the work of the message center will be increased until messages are going through at the rate of sixty

Fig. 9

or even seventy an hour. In a maneuver held by a mobile regiment of artillery during a recent joint Army-Navy maneuver the records showed that 197 messages were handled through the message center in two hours and fifteen minutes. Not only were the messages undelayed by the making of records, but the record was accurate and complete. Not a message went through that was unrecorded.

It is not possible for the present War Department message center system to function at such high speed, nor has the writer found it possible for it to function at a rate of speed higher than thirty or forty messages an hour. On the other hand, it has been found that under this system the speed of transmission is limited only by the speed at which persons can talk, and with a message center chief who is qualified as a typist of a speed of about 60 words a minute, the records will keep pace with the messages.

Of course, there are many abbreviations that must be used by the message center chief. Such common ones as:

rs=ranging shots
ps=platoon salvos
bs=battery salvos
cof=commence firing
cef=cease firing
rept=report

are used to great advantage when the speed of transmission becomes great.

The Method of Speeding Up

The limit of transmission under the separate connection system is about thirty to forty messages an hour. When messages are coming through at a rate higher than that the following procedure will permit both rapid transmission and accurate recording.

FIG. 10

1. When the rush starts, the chief of message center calls all receiving and sending terminals and tells them to stand by for "open connections." When they are reported ready, he calls upon his telephone operator for "Open Connections."

2. With the present type of field switchboard it is possible to connect every telephone on the board into one series, thereby making it possible for each person on a telephone to talk directly to any other person in the series, and his conversation is overheard by everyone else on the circuit. This is in principle like the old-fashioned "party line" upon which each subscriber could listen to what the other one talked about. As a general rule, when this connection is made the following phones are connected in series:

1. Higher command.
2. Group commander.
3. Message center.
4. Firing battery.
5. Firing battery.
6. Firing battery.
7. Searchlights, etc.

The number of connections is limited only by the number of drops on the switchboard, although it is easy to see that the fewer persons who are connected in series the smaller will be the chance for confusion.

3. When the switchboard operator announces that he has made "open connections," the message center chief will verify the presence of the operator from each unit, and he will then act as a communications control post and permit the senders to talk directly to the receivers, making a record of the conversation as he overhears it through his own phone. If, for instance, the commanding officer desires to assign a target, he merely speaks into his phone as follows (assuming it is 5:30 A. M.):

Battery A. Target Pearl. Cruiser traveling left to right. Fire four ranging shots and report.

The Battery A operator will hear this assignment of target and will immediately transmit it to the range section, having received it direct from the commanding officer without the loss of any time at all.

The chief of message center, as the message is sent by the commanding officer, will write on the rough log something similar to the following:

530am Battery A RX
Tgt Pearl cruiser trav lr 4rs and rept
CO Roe Smith XC

In the same manner the commanding officer can assign targets to all batteries. The batteries can report direct to the commanding officer, with the chief of message center making a record of the report and the time.

Assuming that such messages are going over the line and higher command cuts in with an RX message to cease fire. The message center chief will immediately break into the conversation, clear all lines, and give the message.

The great difficulty with this method is the fact that the average operator does not know when to stay quiet. Operators must be instructed to remain silent until they have a chance to call for their party, and with a little drill this can be done easily. There is no difficulty experienced by the one message center of this type in operation. It has been in operation for something like three months without a tie-up in communications.

When the message center chief considers that the critical moment has passed, he may place the message center back on normal operation basis by instructing the telephone operator to "close connections," thus making it necessary to call separately for each message.

The time required for making open connections for a series of twelve telephones is twenty-five seconds. This is an average from twelve tests given. The time required to again close connections is four seconds.

Firing Data for Antiaircraft Gun Batteries

By Major J. C. Haw, 62d Coast Artillery (AA)

NOWHERE has the writer encountered a clear and complete statement of the sources, channels of transmission, and the methods of application of firing data for antiaircraft gun batteries. The various texts describe separate instruments but do not show their combined operation. The summary which follows has been found very useful in teaching gunnery in Officers' Schools.

This description deals solely with fire by Case 1½ (the normal method), in gun batteries equipped with 3-inch guns, model 1918, on auto-trailer carriage, moddel 1917, using the sighting system and fire-control apparatus normally supplied with this gun. The sighting system is described in Ordnance Pamphlet No. 2018 and in such texts as *Gunnery and Position Finding for Antiaircraft Artillery,* published by the Coast Artillery School (see figures 1 and 2). The fire-control apparatus consists of the wind and parallax computer, the data computer, model 1917 (generally known as the R. A. Corrector), and altimeters or a height-finder (see figures 3, 4, and 5). The method of determining firing data with this apparatus is, of course, the "angular-travel" method.

The lateral elements of the sights on the 3-inch gun, model 1918, mounted on auto-trailer carriage, model 1917, have been modified by the Ordnance Department so as to simplify their operation. The operation of these modified sights is as follows: The lateral deflection setter simply sets off the deflection received from the range section; this displaces the line of sight with reference to the axis of the bore. It is then only necessary for the gun pointer to traverse the piece until he is on target.

I. Corrections Used in Antiaircraft Artillery Firings

1. *a.* Unlike those of seacoast artillery, the fire-control systems now in use by antiaircraft artillery batteries have no provision for the application of corrections computed anew for every position of the target, with the exception of corrections for wind effects and parallax. The latter corrections are computed on the wind and parallax instrument and applied on the R. A. Corrector as described in par. 11 *b.* (4) below.

b. Various corrections are often made, however, in spite of the fact that they are generally applicable to but one position of the target; the battery commander considering that as long as the target is in a certain vicinity these corrections are close enough approximations to improve the accuracy of fire. These corrections will now be discussed.

2. It is possible to correct for non-standard muzzle velocity (if we can determine its true value by firings with screens and chronograph) by constructing

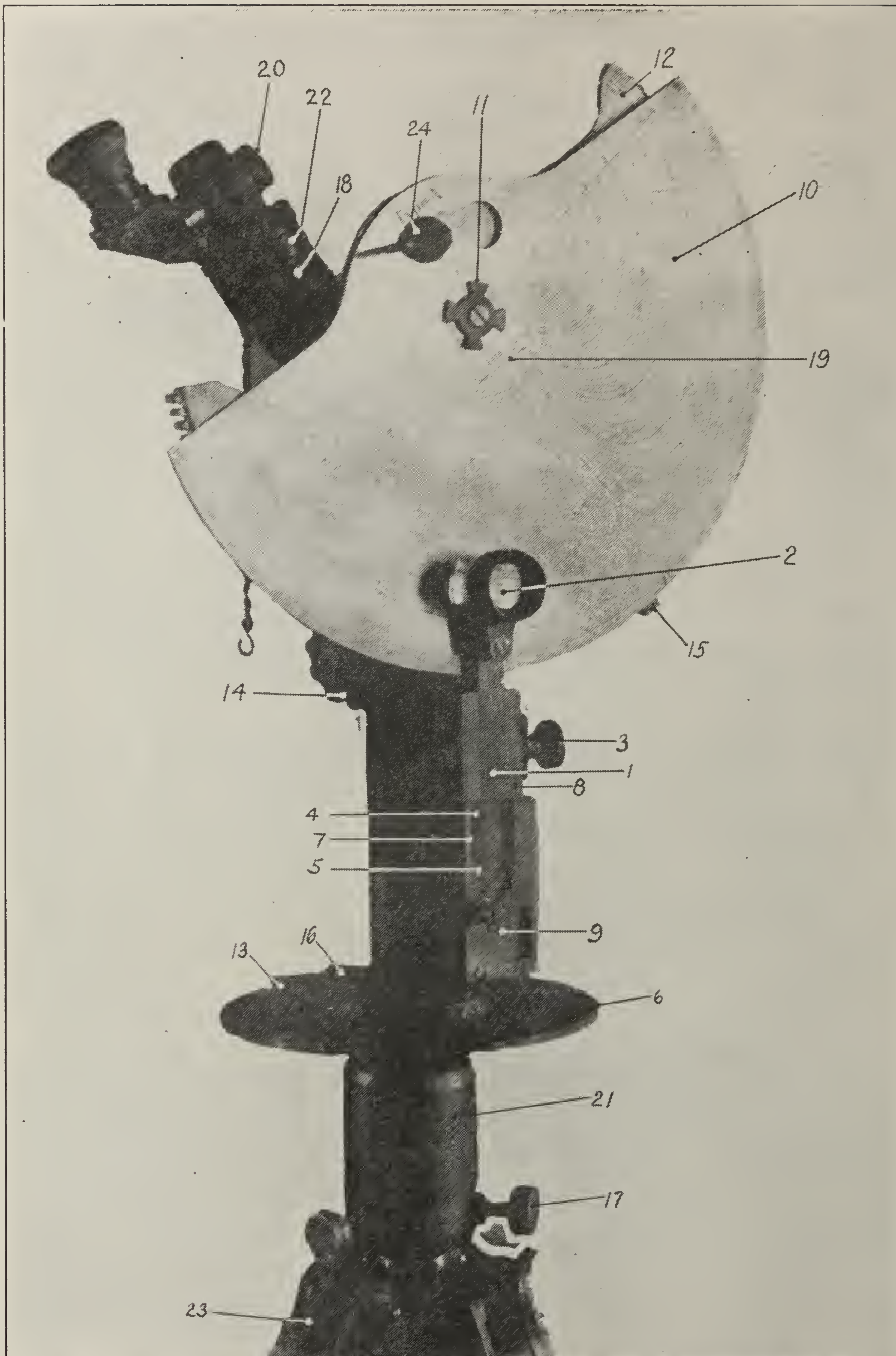


FIG. 1. ALTIMETER, MODEL 1920

1. Altitude scale.
2. Altitude scale pointer.
3. Altitude scale pointer knob.
4. Altitude index (1b).
5. Altitude index (2b).
6. Azimuth circle.
7. Ballistic correction slide.
8. Base-line scale.
9. Base-line index.
10. Curve disk.
11. Curve disk retainer.
12. Curve disk support.
13. Declinator.
14. Elevating handwheel.
15. Elevating compensating index.
16. Level.
17. Leveling screw.
18. Locking pin.
19. Orienting arrow.
20. Sight.
21. Spindle bushing support.
22. Telescope support.
23. Tripod head.
24. Wing nut (curve disk).

new sets of curves for the fuze-range and time-of-flight cylinders on the R. A. Corrector and new curves on the fuze-range disk of the gun; but this is a complicated and tedious process, requiring hours, and does not permit the application of corrections of the moment.

3. *a.* A certain degree of preparation of fire is attainable, nevertheless. This is accomplished by firing trial shots, stripping wind effects from the results, and applying flat corrections for the remaining abnormalities. Obviously, these corrections are absolutely correct for one point only. The solution of the trial-shot problem is described in a bulletin issued by the Chief of Coast Artillery. From trial shots, three corrections are obtained. The corrections to the vertical and lateral deflections are applied on the gun as described in par. 9, below. The correction to the fuze range is applied by the fuze cutter, who sets off on the corrector scale of the fuze setter (instrument) the corrector setting ordered by the battery commander. This setting should be checked, as many fuze setter instruments have so much backlash that each instrument may require an additional correction to compensate for those errors which are produced by mechanical defects. Ten corrector settings are equal to one unit of fuze range.

b. It is apparent from the preceding paragraph that the correction for drift is included in the lateral deflection correction determined from trial shots and set on the gun as described in par. 9 *b.* below.

4. *Adjustment of fire. a.* There is no need to discuss here the difficulties of securing correct reports of deviations from observers located near the battery. In addition, the target is usually under fire so short a time that very few shots are fired after adjustment corrections have been applied, so there is rarely sufficient evidence to prove the worth of the corrections. Further, even in target practice the adjustment correction applied on one course may be worthless on the next due to changes in angular height, which vitiate the worth of the flat corrections. In spite of these difficulties, adjustment of fire is practicable and, under present conditions, necessary. If time permits, the bursts should be brought on to the gun-target line by changes in the vertical and lateral deflection before a range adjustment is attempted. However, deflection and range adjustments are sometimes executed simultaneously.

It is useless to attempt range adjustment unless reliable sensings are available. With the naked eye, it is impossible to "sense" bursts correctly. However, there are two ways in which to determine whether the bursts are over or short; the most reliable way is to have a flank observer stationed as nearly as possible on the prolongation of the course of the target; the other way, which gives good results if a skilled observer is employed on the instrument, is to "sense" the bursts by means of a stereoscopic instrument, usually the height-finder. A coincidence instrument is useless for this purpose.

Once the bursts are brought on to the gun-target line, or nearly on it, by deflection corrections, the range is adjusted by correcting the altitude or by correcting the fuze range. The former method is generally considered to be

the better of the two, since by correcting the altitude the deflections are also affected in the proper direction, while a change in the fuze range affects no other elements of firing data.

b. The mechanics of applying the corrections are as follows:

(1) The vertical and lateral deflection corrections are mentally added algebraically, by the deflection readers, to the algebraic sum of the other deflection corrections and set off on the secondary deflection scales of the R. A. Corrector. (See the several mentions of arbitrary deflection corrections applied during firing, par. 11 below.)

(2) Altitude corrections are applied on the R. A. Corrector (See par. 11 *b* (2) below).

(3) A correction may be applied to the fuze range, to shift the burst along the trajectory. It is applied on the corrector scale of the fuze setter (instrument). (See par. 10 *d.* below.) Ten corrector divisions are equal to one unit of fuze range.

5. *a.* When they are necessary, parallax corrections are computed on the wind and parallax computer and added algebraically to the other corrections, which, combined, are set off on the secondary deflection scales of the speedometers of the R. A. Corrector, as explained in succeeding paragraphs. Ordinarily, however, the R. A. Corrector is placed so close to the guns (70 to 100 yards from center of firing battery) that parallax corrections are unnecessary. In reading the following paragraphs, therefore, remember that the parallax corrections mentioned are usually zero.

b. The correction for wind is computed and applied in the same way. It is based on a ballistic wind. (See reference to wind and parallax corrections in par. 1 *a.*) The wind correction, unlike the parallax correction, is rarely zero.

6. *a. Correction for error in length of altimeter base line.* (Not applicable when a height-finder is used.) This correction may be applied on the B′ altimeter; the altitudes read will then differ from their uncorrected value by the same percentage as the percentage value of the base-line correction. There is rarely any occasion for this correction; however, it is useful when the length of the base line has not been accurately determined. The process would be as follows: Fire trial shots, using altimeters to measure altitude of bursts; strip wind effects from the resulting data; compare the stripped altitude with that expected, thus arriving at a percentage value; the percentage correction can then be applied to the assumed length of base line. Since differential effects of muzzle velocity, etc., are not taken into account, the resulting correction is obviously only an approximation, but it may be valuable when lack of time prevents an accurate survey of the baseline.

b. Correction for difference in elevation of altimeters. If the two altimeters are at different elevations, a correction may be applied. Altimeter instruments are so constructed that by adding one-half the angular difference in elevation to each instrument the altitude determined will be that above the midpoint of the altimeter baseline.

II. Data Required at Guns

7. At the instant of firing a gun at a moving aerial target by case 1½, that is, at the instant that the target is in "present position," the line of sight must bear a certain correct relationship to the axis of the bore. This relationship may be resolved into a vertical angle and a horizontal angle.

a. The vertical angle is the algebraic sum of the following items:

(1) *The vertical deflection,* which in turn consists of the algebraic sum of:

(*a*) *The principal vertical deflection,* which corrects for vertical angular travel of target during time of flight.

(*b*) *The secondary vertical deflection,* which is the algebraic sum of the *arbitrary vertical correction* and the *vertical correction for wind effect and parallax.*

(2) *The super-elevation,* or additional elevation that must be applied to allow for the curve of the trajectory.

b. The horizontal angle is the *lateral deflection,* composed of the algebraic sum of:

(1) The *principal lateral deflection,* which corrects for the lateral angular travel of target during time of flight.

(2) The *secondary lateral deflection,* which is the algebraic sum of the *arbitrary lateral correction* (including the *correction for drift*) and the *lateral correction for wind effect and parallax.*

8. It is also necessary to set the fuze of the projectile, which requires a knowledge of the *future fuze range* and the *corrector setting.*

III. Sources and Application of Data Reaching Gun

9. Certain of these items reach the guns from the sources named below and are applied as indicated:

a. The arbitrary vertical correction determined from trial shots is announced by the battery commander and set on the arbitrary vertical correction scale which is mounted on the right trunnion of the cradle of the piece.

b. The arbitrary lateral deflection determined from trial shots is announced by the battery commander and set on the lateral deflection scale on the sight by making a new index mark in pencil.

10. All other data (except the corrector setting), reach the gun from the R. A. Corrector.

a. Vertical data.

(1) The deflection received at the gun continuously by telephone, from the vertical deflection reader of the R. A. Corrector detail and set off on the vertical deflection scale on the right trunnion of the cradle, is actually the algebraic sum of the following angular values:

(a) The principal vertical deflection.

(b) The vertical correction for wind effects and parallax.

(c) Arbitrary vertical corrections ordered by the battery commander *during* firing.

(2) The super-elevation is set off by the operation of the fuze range disk and pointer. Its value is received in the guise of a future fuze range called out by the fuze cutter as each fuze is set, he in turn having received this future fuze range by telephone every four seconds from the range reader of the R. A. Corrector detail.

b. Lateral data.

The deflection received at the gun continuously by telephone from the lateral deflection reader of the R. A. Corrector detail is the true lateral deflection (algebraic sum of principal and secondary lateral deflections), except that the arbitrary lateral correction item included in it is only the arbitrary lateral correction ordered *during firing*, and is exclusive of the arbitrary lateral correction determined from trial shots. This lateral deflection received from the R. A. Corrector is set on the lateral deflection scale of the sight on the left of the gun.

c. Arbitrary vertical and lateral corrections ordered *during firing* are thrown into the R. A. Corrector because it is not practicable to set them on the gun while firing is in progress.

d. Fuze setter data.

The fuze cutter sets off on his fuze setter (instrument) the future fuze range received by telephone every four seconds from the range reader of the R. A. Corrector detail; the corrector setting ordered by the battery commander is set off on the corrector scale of the fuze setter instrument by another cannoneer.

IV. The R. A. Corrector

11. *The R. A. Corrector.* (Reference numbers refer to Fig. 2.)

a. From the above, it is evident that the R. A. Corrector turns out vertical and lateral deflections (both without corrections determined from trial fire) and future fuze ranges.

b. The following data must be supplied to the R. A. Corrector from outside sources:

(1) The *altitude* is obtained by a height finder or by altimeters at the ends of a base line. It is set by setting the altimeter pointer (20) to the proper altitude on the altitude scale (19). This operation automatically revolves the time of flight cylinder, thus inserting the altitude factor into both vertical and lateral deflection computations; and automatically revolves the fuze range cylinder also, thus inserting altitude into the fuze range computations.

(2) *The altitude correction*, if any, is announced by the battery commander. It is set on the altitude correction scale (21) by moving the altitude scale proper (19), thus applying the correction to every subsequent setting of the altitude pointer (20) since the latter is always set opposite some

specified graduation of altitude scale (19). Obviously this is a *flat* correction.

(3) *Arbitrary vertical and lateral corrections* may be announced by the battery commander while firing is in progress. They are mentally added algebraically to the wind and parallax corrections and the resulting values are set as secondary deflections on the speedometers by moving the indices (72) and (65) to the proper setting on the correction scales (73) and (66). The movement of these pointers revolves the deflection scales (70-71) and (63-64), from which the deflections sent to the guns are read. The "complementary term" correction is also set on the secondary deflection scale of the vertical speedometer. (See par. 11 *c* (1), below.)

(4) *Wind and parallax corrections.* These are obtained from the wind and parallax instrument. The preceding sub-paragraph explains how they are applied to the R. A. Corrector.

c. By the operation of the instrument itself, vertical and lateral angular velocities are measured and the data to be sent to the guns are computed. We will consider the computation of the fuze range later.

(1) No secondary lateral deflections, other than the corrections already discussed, are set off on the lateral speedometer. On the vertical speedometer, however, it is necessary to set off on the correction scales (73) and (66) a "complementary term" (always negative) which corrects for an error in the computation of the time of flight used in determining the vertical deflection. The "complementary term" correction is mentally added algebraically to the other secondary vertical corrections and the resulting value set on the vertical speedometer as described in par. 11 *b.* (3) above. The "complementary term" correction is obtained by reading the "complementary term" cylinder under the pointer (51); this cylinder (55) is revolved manually so that it is always set at the lateral deflection read from the lateral speedometer, while the pointer (51) is moved automatically by the movement of the vertical telescope proportionally to the angular height.

(2) Since we have now considered all the elements which enter into the setting of the speedometer scales, we can turn our attention to the speedometer pointers or needles (69 and 62) whose positions indicate final deflections to be sent to the guns. It is evident that we have accounted for all elements of the vertical and lateral deflections computed by the R. A. Corrector except the predictions for travel of target during time of flight. Without going into the details of mechanisms or mathematics, we will consider the methods by which the speedometer needles are given the correct angular displacement. Each needle is actuated by a small upright disk in contact with a large horizontal disk, which in turn is revolved by the movement of the corresponding sight. Obviously the speeds of rotation of the horizontal disks are proportional to the angular speeds of the target, while, by moving the small upright disks radially with respect to the horizontal disks by amounts proportional to the time of flight, the rate of rotation of the small upright disks, and the consequent angular displacement of the speedometer needles, will be proportional

to the travel of the target during the time of flight. It is therefore necessary to determine the value of the time of flight and apply it.

(a) *For Vertical Deflection.* The vertical disk (41) is displaced radially with respect to the horizontal disk below it by moving the vertical time pointer (34) to the proper t″ curve on the *left* of the corrected time cylinder. The t″ curve to be used is that whose value is read on the time of flight cylinder under the time of flight pointer (29). (This pointer is moved automatically by the vertical motion of the sights proportionally to the angular height, while the time of flight cylinder, as stated in par. 11 *b* (1), above, is automatically set when the altitude is set off.) But the corrected time cylinder must also be properly set; this is done by revolving it until the vertical deflection (read from the vertical deflection speedometer) is set off under the vertical deflection setting pointer (31); this pointer is moved automatically by the vertical motion of the sights proportionally to the angular height.

(b) *For Lateral Deflection.* The small upright disk (42) is moved radially with respect to the horizontal disk beneath it by moving the lateral time pointer (38) to the correct *t″* curve on the *right* of the corrected time cylinder. As in the case of vertical deflection, the *t″* curve to be used is that whose value is read from the time-of-flight cylinder under the time-of-flight pointer; while the settings of the corrected time cylinder and time-of-flight cylinder have already been described.

d. Future Fuze Range is read on the fuze range cylinder under the fuze range pointer (25). As already stated, the fuze range cylinder is automatically set by the operation of setting off altitude. The fuze range pointer is moved automatically by the vertical motion of the sights proportionally to the angular height, and is further displaced by the operation of moving the dead-time pointer (56). The dead-time pointer is moved manually to set off on the dead-time cylinder the value of the principal vertical deflection, obtained from the vertical speedometer. The dead-time cylinder is moved automatically whenever the vertical time pointer (34) is moved.

12. The following summation of certain points about the R. A. Corrector will assist in fixing upon the mind its construction and mode of operation, but note that these points cover certain selected phases only:

a. Dead time affects the fuze range only; it is not considered in computing vertical and lateral deflection.

b. The "complementary term" affects vertical deflection only; it is not considered in computing lateral deflection and fuze range.

c. The operation of setting off the altitude by moving the altitude pointer (20) along the altitude scale (19) revolves the time-of-flight cylinder and the fuze range cylinder.

d. The vertical motion of the telescopes moves the following parts proportionally to the angular height: vertical deflection setting pointer (31), present angular-height pointer (30), time-of-flight pointer (29) (these three pointers are connected rigidly together); fuze range pointer (25) and future

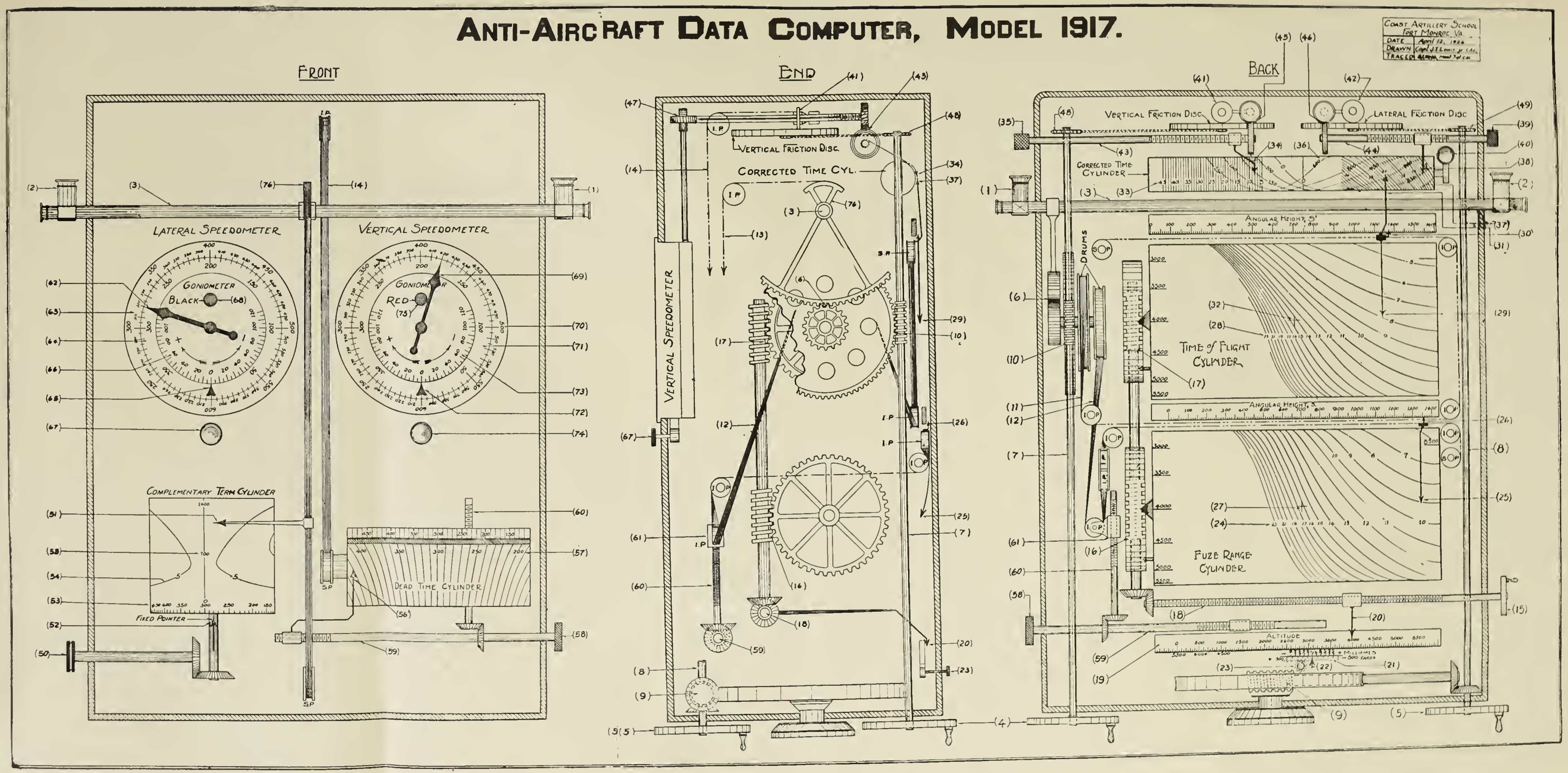


Fig. 2. Antiaircraft Data Computer, Model 1917

angular-height pointer (26), which are rigidly connected and are further displaced automatically by the operation of setting the dead-time pointer (56); complementary term pointer (51). Thus a total of six pointers is moved by the vertical motion of the telescopes.

e. The dead-time cylinder is revolved automatically by the operation of setting the vertical time pointer (34).

f. The following operations are accomplished manually: setting of corrected time cylinder; setting of dead-time pointer (56); setting of complementary term cylinder; setting of lateral time pointer (38) and vertical time pointer (34); setting of lateral and vertical deflection scales (63-64 and 70-71) by moving indexes (65) and (72) to proper settings on secondary deflection scales (66) and (73); setting of altitude correction by moving altitude scale (19); setting of altitude pointer (20).

13. It is evident that the lateral and vertical deflection readers, especially the latter, must be nimble mental gymnasts in order to arrive at the true algebraic sum of the many corrections which are combined to form the secondary deflections, and to set off the resulting values properly on the secondary deflection scales and to perform their other duties. Hence, in order to avoid errors, the corrections ordered should be reduced to the minimum.

V. Wind and Altitude Data

14. Data for wind and altitude are determined independently of the R. A. Corrector and supplied to that instrument.

a. A ballistic wind is determined by the meteorological section. In antiaircraft fire, the weighting factors are often taken as unity; that is, the winds in the different atmosphere layers of equal depth are considered to affect the trajectory equally. The wind and parallax instrument resolves the wind effect into lateral and vertical effects for every position of the target, and these data are supplied to the R. A. Corrector and set off as described in par. 11 *b.* (4) above.

b. The determination of altitude and its application on the R. A. Corrector are discussed in par. 11 *b.* (1) above.

"Such a program involving training, discipline and preparedness, free from militaristic propaganda, will have the support of all Americans." **Arthur Brisbane, in the Washington Herald, August 20, 1923.**

Early Coast Fortification

IT is a singular fact that of all the plans submitted to Congress at the close of the Revolutionary War looking to the organization of a peacetime military establishment, not one took into consideration the necessity of providing for the defense of the maritime frontier. During the war, coast defense had been a function of the several States, the Government finding it necessary to devote its entire attention to defeating the enemy in the field. It is probable that the proponents of the peace measures considered—if they thought of the matter at all— that the States could continue to furnish their own coast fortifications, but if so they neglected the obvious fact that the States had not theretofore provided effective fortifications. Even during the colonial period, the defenses had almost invariably been inadequate to the requirements; and at the close of the Revolution there were few coastal works not in ruins, and none in a serviceable condition.

In the years immediately following the disbanding of the Continental troops, the entire force—too small to be called an army—in the service of the United States was employed along the land frontiers. The artillery was armed as infantry and served as infantry. The only difference between the two branches was that the artillery also served the guns in the frontier forts and those taken on expeditions against the Indians. Properly speaking, they were artificers, rather than artillerymen, and when the time came to take up their duties in coast defense they were unprepared.

The threat of war with Great Britain, growing out of disputes over unsettled boundaries and over British treatment of American seamen, turned the eyes of the infant nation from the depths of the backwoods to the undefended seaboard. Here was opening up an entirely new field of service for the artillery, one which brought about the reorganization and expansion of that branch of service under the act of May 9, 1794.

Before this date, however, the fortification of the coast had been begun. On February 27, 1794, a committee had recommended to Congress the fortification of sixteen points along the Atlantic shore line—Portland, Portsmouth, Cape Ann, Salem, Marblehead, Boston, Newport, New London, New York, Philadelphia, Baltimore, Norfolk, Wilmington (N. C.), Ocracoke Inlet, Charleston, and Savannah, to which Wilmington (Del), Annapolis, Alexandria, and Georgetown (S. C.) were subsequently added. On March 20, Congress appropriated the necessary funds, and by the end of the year the project was near completion save in Boston Harbor and at one or two other points.

This first project contemplated the erection of earthen batteries, faced with timbers at such places where earth of an adhesive quality could not be obtained.

The strictest economy was necessary, and it was felt that a tenacious earth, properly sloped, sodded, and seeded with knot-grass, would be durable and would afford sufficient protection so far as naval attacks were concerned.

Naval science had not then developed to a point where landings in force on an open beach were considered practicable, and the coast batteries were therefore required only to prevent the use of harbors and wharves by the enemy and to protect communities from bombardment. Small landings on beaches were, nevertheless, practicable, and the batteries themselves required protection from land attack or raids. This introduced into coast defense a conception from which the Coast Artillery is still suffering—local defense by the artillerymen themselves.

In the immediate vicinity of each battery, or group of batteries, particularly where the battery occupied an exposed position at a distance from the town it defended, on a point of land, or on an island, there was to be erected a strong redoubt or other inclosed work (or a blockhouse for batteries of lesser importance), in which one or two pieces of light artillery would be mounted. This redoubt, or blockhouse, thus became a barrack for the garrison and a citadel protecting the battery from attack from the landward side. In case of such an attack, the apparent idea was that the gunners would retire to the citadel, take up the small arms with which they were provided, and become infantry for the time being—an idea which the Artillery accepted without protest until within very recent years.

The weapons best suited for the coast forts were considered to be the 24 and 32-pounders, of which the entire project called for about 450. Of these, it was thought that 150 could be obtained from materiel on hand and 150 from guns in possession of the States, leaving about 150 to be manufactured. To allow for possible shortages, the purchase of one hundred of each of these heavier calibers was authorized by Congress.

At that time there was on hand a great variety of calibers remaining from the Revolutionary War. The return of ordnance, arms, and implements, of December 14, 1793, shows 214 iron guns, 49 iron howitzers, 2 iron mortars, 2 iron cohorns, 153 brass guns, 43 brass howitzers, 63 brass mortars, and 1 brass cohorn. The calibers included: Iron, 1, 2, 3, 4, 6, 9, 12, 18, and 24-pounder cannon, 3½ and 5½-inch howitzers, 13-inch mortars, and 18-pounder carronades; brass, 2, 3, 4, 6, 8, 12, and 24-pounder guns, 2¾, 4½, 5½, and 8-inch howitzers, and 4.4, 4½, 5½, 8, 10, 13, and 16-inch mortars. The following were available among the heavier types:

	Iron	*Brass*
24-pounder	12	3
18-pounder	36	----
12-pounder	49	11
8-inch howitzer	----	18
5½-inch howitzer	2	17
16-inch mortar	----	1
13-inch mortar	2	4

10-inch mortar	----	19
8-inch mortar	----	3
5½-inch mortar	----	19
	103	92

Prior to 1800 there was no noteworthy change in the calibers of artillery constructed for seacoast artillery. The 42-pounders was added in 1801 and the 50-pounder Columbiad in 1811. In the project of 1818, these, as well as the 100-pounder, formed a part of the seacoast materiel.

The guns available in 1794 were of both brass and cast iron. Though more expensive than cast iron, brass cannon were favored because there was less danger of bursting. The Revolution had practically compelled the colonists to use the iron and thus demonstrate its possibilities, and there ensued a long contest between the two metals (the brass being substantially what was afterwards known as bronze), with cast iron steadily growing in favor. In the end it displaced brass, only itself to be superseded at about the opening of the Civil War. In the heavier guns for coast defense, the project of 1794 established cast iron as the metal to be used, and from that time until wrought iron appeared, no other metal was used for the heavy coast cannon.

The multiplicity of calibers was not, of itself, a great inconvenience, but there were many varieties of each caliber, owing to the fact that each foundry cast its guns according to its own plans. This led to great confusion in the manufacture of gun carriages. These carriages were, as a rule, wooden frames, although there were also carriages made in two parts—a chassis and a top carriage. In 1818 cast-iron carriages were adopted to replace those made of wood, but in 1839 a reactionary spirit brought the wooden carriage again into favor, where it held its place for fifteen years before being definitely and finally displaced.

The project of 1794 contemplated the use of two kinds of carriages for the seacoast armament—"coast" carriages (which might be casemate or barbette) and "traveling" carriages. These latter, which must not be confused with the "light field" carriages, are particularly worthy of note in view of the use of mobile artillery in coast defense today.

The term "traveling carriage" was not applied to the carriages of any particular calibers. There were "heavy" and "light" guns for every caliber in the service. Light field carriages were used with the light guns of whatever calibers constituted the field artillery of a force in the field. The traveling carriage, less mobile and more rugged in construction, was used to transport every type of "heavy" gun, and was therefore as necessary with the heavy 6-pounder as with the heavy 24-pounder. Guns mounted on traveling carriages were employed as siege or garrison artillery or, in battle, as guns of position. In coast defense they were, as a rule, held in reserve, to be moved into position when and where danger threatened.

The construction and occupation of the works of 1794 demanded both engineers and artillerists, of which the Army possessed neither. Pending the organization of the Corps of Artillerists and Engineers, the Government employed a number of civilians as temporary engineers to put up the necessary works. Stephen Rochefontaine, assigned to the New England coast from New London north, was the most capable of the engineers so employed, and by the end of the year had his works practically completed, except at Boston, where the Governor would not approve the plans without the sanction of the Legislature, which delayed taking action. Charles Vincent, appointed engineer for New York; John Jacob Ulrick Rivardi, for Baltimore and Norfolk; and Paul Hyacinte Perrault, for South Carolina and Georgia, had their portions of the project well under way by December. Charles L'Enfant, engineer for Philadelphia and Wilmington; John Vermonnet, for Annapolis and Alexandria; and Nicholas Francis Martinon, for North Carolina, accomplished little.

The project called for a battery, a redoubt, and a blockhouse each at Portland, Portsmouth, Governor's Island (Boston), New London, Groton, Governor's Island (New York), Paulus Hook, Baltimore, Norfolk, Wilmington (N. C.), Charleston (three sets), and Savannah; a battery and a blockhouse each at Gloucester (Cape Ann), Salem, Marblehead, in New York City (several sets), and Ocracoke Inlet; traveling carriages, with no battery, at Newport; and repair of works only at Castle Island (Boston), Goat Island (Newport), and Mud Island (Delaware). The total estimated cost was $76,053.62 for the fortifications, and $96,645.00 for the manufacture of two hundred cannon.

With the dissipation of the war clouds there was a relaxation in the matter of coast defense, although some work continued. The first project may be considered to have been complete by the end of 1795, but almost at once preparations on a second project became necessary, for war with France appeared to threaten. The earthen works of 1794 had deteriorated rapidly and large appropriations were necessary to effect repairs. Philadelphia, New York, Newport, Baltimore, and Charleston were considered inadequately defended and large sums were spent at these points in new construction. No new places appear in the project of 1798, but Cape Ann, Wilmington (Del), Annapolis, Alexandria, and Georgetown (S. C.) disappear. At a few of the other harbors no funds were spent, but at most of them some repairs were found necessary. Later, the Louisiana purchase brought New Orleans into the program.

At this time the artillery was scattered in many small detachments along the seacoast and on the land frontier. The largest detachment, in December, 1802, consisted of 118 officers and men at New Orleans; and no other exceeded seventy-five. Ten stations were garrisoned by from fifty to seventy-five officers and men; twelve had from twenty-five to fifty; and four numbered less than twenty-five. It was therefore impractisable to keep the coast forts in good repair, especially those not garrisoned. In 1807, under the stress of imminent war with Great Britain, the necessity for the repair of the coast defenses brought about an entirely new project.

In December, 1807, the Government, in preparing this new program, classified the harbors into the more important ports and those of minor importance. In the two groups it listed practically all the ports and harbors of the Atlantic and Gulf seaboards, and then, from fear that some might have been overlooked, it made provision for other places that might be found to require defense. Work was undertaken promptly and was advanced rapidly. By February, 1810, $640,000 had been expended. When the war actually broke out, the project was essentially complete; at which time the results of the three programs—1794, 1798, and 1807—were about as follows, all works being in good condition unless otherwise stated:

Passamaquoddy: Fort Sullivan, erected on Moose Island in 1808-1809, was a circular battery of stone, mounting four heavy guns, covered by a blockhouse.

Machias: Under the project of 1807 there was erected a circular battery of stone, mounting four heavy guns, covered by a blockhouse.

Penobscot: Under the project of 1807 there was erected a small inclosed battery, mounting four heavy guns.

Castine: Fort George, at Robinson's Point, on the east side of St. George's River, erected in 1808-1809, was a small inclosed battery, mounting three heavy guns.

Damariscotta: On the southeastern angle of Narrow Island, and in the town of Boothbay, on the Damariscotta River, there was erected, under the project of 1807, a small inclosed battery, mounting three heavy guns, covered by a blockhouse.

Edgecomb: On Davis' Point, on the east side of Sheepscot River, there was erected a small inclosed battery, with six heavy guns, covered by a blockhouse, as a part of the project of 1807.

Georgetown: On Shaw's Point, on the west side of the mouth of Kennebec River, there was erected in 1808 an inclosed work, with a battery of six heavy guns.

Portland: Fort Sumner, authorized in 1794, was built on the hill formerly occupied by Fort Allen as a small inclosed work with parapets supported by stone walls and sod; largely rebuilt in 1798-1799, and kept in repair until 1802; comprised also a blockhouse and a detached battery for heavy cannon near the water; rebuilt in 1808 as a battery of five guns, with a brick gun house containing four and eighteen-pounders on traveling carriages. *Fort Preble* (1808), on Spring Point, at the entrance to the harbor, was an inclosed star fort of stone and brick masonry, with a circular battery with flanks, mounting fourteen heavy guns. *Fort Scammel* (1808), on House Island, opposite Fort Preble, was a circular battery of masonry, mounting fifteen heavy guns, covered in the rear with a wooden blockhouse mounting six guns.

Portsmouth: Fort Constitution, on the eastern point of Newcastle Island, at the entrance to Piscataqua River, three miles below Portsmouth, was begun in 1794 as a fort of masonry and sods, with a citadel; practically rebuilt in 1800-1801, it was completed under the project of 1807 as an irregular work of

masonry, mounting thirty-six heavy guns. *Fort McClary* (1808), on Kittery Point, opposite Fort Constitution, was a circular battery of masonry, inclosed by earth and palisades, mounting ten heavy guns. In *Portsmouth,* a brick arsenal (1808) contained three 24-pounders and three 18-pounders on field carriages.

Newburyport: On the east point of Plum Island, at the mouth of Merrimac River, an inclosed battery of timber and earth, mounting five heavy guns, was built as part of the project of 1807.

Gloucester (Cape Ann): In 1794 a battery and a blockhouse were erected at the head of the harbor on the site of an old fort. Omitted from the project of 1798. An inclosed battery, mounting seven heavy guns, covered with a blockhouse, was erected under the project of 1807.

Salem: Fort Pickering, situated on the west side of the harbor entrance, was erected in 1794 on the site of old Fort William as an inclosed work of masonry and sods; repaired in 1800 and improved in 1808 to mount six heavy guns.

Marblehead: Fort Sewall, situated on the west point of the entrance to the harbor, erected in 1794 on the site of an old fort, was an inclosed work of masonry and sods, covered with a blockhouse; rebuilt in 1799 and improved in 1808 to mount eight heavy guns.

Boston: Boston Harbor was included in the project of 1794, but delay in securing State approval of the plans prevented any work except a limited amount of repairs among the ruins of *Castle William,* on Castle Island, on the south side of the inner harbor. *Fort Independence,* a regular pentagon, with five bastions of masonry, mounting forty-two heavy guns, and two batteries for six guns, was begun in 1800, practically completed in 1803, and extensively repaired under the project of 1807. *Fort Warren,* on the summit of Governor's Island, opposite Fort Independence, a star fort of masonry, mounting twelve guns, was erected under the project of 1807. On the south point and the west head of the island, circular batteries of masorny, mounting ten guns each, were also constructed.

Charlestown: Near the Navy Yard, on the point formed by Charles and Mystic Rivers, a circular battery of earth, on a stone foundation, mounting eight heavy guns, was erected in 1808.

Plymouth: On Gurnet Point, at the entrance to the harbor, an old inclosed fort, mounting five guns, was repaired with stone and sod in 1808.

New Bedford: On Eldridge Point, at the entrance to the inner harbor, an inclosed work of masonery, mounting six guns, was erected in 1808.

Newport: In 1794, a fort on Goat Island, a guard house on Tammany Hill, and a battery at Howland's Ferry were erected. *Fort Adams,* on Briton (Brenton) Point, on the east side of the entrance to the harbor, was an irregular star fort of masonry, with an irregular indented work of masonry adjoining it, mounting seventeen heavy guns, begun in 1798 and repaired and extended in 1808. *Fort Wolcott,* on Goat Island, in the center of the harbor, was a small inclosed irregular work, with open batteries, extending from two opposite

flanks, of stone and earth, mounting thirty-eight heavy guns; principally built in 1798 on the site of the 1794 fort, and repaired and extended in 1808. On *Rose Island*, situated to defend the north and south passages of the harbor, a regular work of masonry with four bastions (two of them circular), to mount sixty guns, was begun in 1798, but was left unfinished. On a bluff of rocks called the *Dumplins*, on Conanicut Island, nearly opposite Fort Adams, a circular tower of stone, with casemates, was begun in 1798, but was left unfinished. On *Eaton's Point*, at the north point of the town, an elliptical stone battery had been erected, but was in ruins by the end of 1811. In Newport were some guns on traveling carriages.

Bristol: Ten guns on traveling carriages protected this town under the project of 1807.

Stonington: A brick arsenal, with four 18-pounders on traveling carriages, was provided by the project of 1807.

New London: Fort Trumbull, situated on the west side of the harbor, was an inclosed irregular work of masonry and sod, mounting eighteen heavy guns, erected during the Revolutionary War, repaired in 1794-1795, restored in 1799, and further improved in 1808.

Groton: A fort of earth and sods was begun in 1794, but was left unfinished.

New Haven: Fort Hale, on the eastern side of the harbor, was an elliptical inclosed battery, mounting six heavy guns, erected in 1808-1809.

New York: Fort Jay, on Governor's Island, within half a mile of the city, was a regular inclosed work, with detached batteries for heavy cannon and mortars. The first fort, of earth, with two detached batteries, which had been built in 1794-1795, was rebuilt in 1798-1801 at considerable expense; but in 1806 the whole was demolished (except walled counterscarp, grate, sallyport, magazine, and two barracks) and removed as rubbish to make room for a new work of the same shape. *Fort Columbus*, built on the site of Fort Jay, was a regular inclosed pentagonal work of masonry, with four bastions and a ravelin, mounting sixty heavy guns. *Castle William*, on a projecting point of rocks at the western extremity of the island, begun in 1808, was a stone tower, with fifty-two 42 and 32-pounders, mounted in two tiers, under a bomb-proof roof, with a terrace above intended to mount twenty-six 50-pounder Columbiads. *Bedloe's Island*, nearly opposite Governor's Island, was provided with a battery in 1794. *Fort Wood*, a star fort of masonry, mounting twenty-four heavy guns, with a brick arsenal, was erected in 1809-1810. *Ellis (Oyster) Island*, opposite Fort Columbus, was also provided with a battery in 1794-1795. *Fort Gibson*, an inclosed circular battery of masonry, mounting fourteen heavy guns, was erected in 1809 to cover the entrance to North River. In *New York*, a formidable battery of heavy cannon and mortars, erected at the southwest point of the city in 1794-1795, was in ruins by 1806. *Castle Clinton*, an inclosed circular battery of stone, mounting twenty-eight heavy guns, was erected in 1809 about a hundred yards in front of the west head of the grand battery. *Humbert Battery*

an inclosed circular stone battery, mounting sixteen heavy guns, was built in 1809 one mile up North River. Within the city was a brick arsenal, with one brass 24-pounder, seven 12-pounders, 4 brass howitzers, and twenty-two iron 18-pounders, all on traveling carriages; and three miles above the city was a brick arsenal and laboratory.

Sagg Harbor: Under the project of 1807, a brick arsenal, with four 18-pounders on field carriages, was provided.

West Point: Fort Putnam was repaired and altered in 1794-1795.

Philadelphia: A fort on Mud Island, seven miles below Philadelphia, was begun in 1794, and a large pier, as a foundation for a battery, was laid on a sand bar opposite the island. *Fort Mifflin,* principally built in 1798-1800 and extensively repaired in 1808-1809, was an irregular inclosed work of masonry, defended by bastions, demi-bastions, etc., mounting twenty-nine heavy guns, with a water battery without the works, mounting eight heavy guns.

Wilmington, Del.: A site was selected and surveyed in 1794, but no works were erected. A brick arsenal, with four 12-pounders on field carriages, was built in 1809.

Newcastle: A brick arsenal, with four heavy guns on field carriages, was built in 1809.

Baltimore: Under the project of 1794, a battery was erected and some guns mounted. *Fort McHenry,* at the entrance to the harbor, erected principally in 1798-1800, was a regular pentagon of masonry, mounting thirty guns, with a water battery, mounting ten heavy guns.

Annapolis: A site was selected and surveyed in 1795 and some preliminary work was done, but an unfavorable report caused the project to be abandoned. *Fort Madison,* at the western entrance to the harbor, erected in 1809, was an inclosed work of masonry, comprehending a semi-elliptical face, with circular flanks, mounting thirteen guns. *Fort Severn,* on Windmill Point, a circular battery of masonry, mounting eight heavy guns, was erected in 1809.

Washington: Fort Washington, at Warburton, on the east side of Potomac River, between Alexandria and Mount Vernon, erected in 1808-1809, was an inclosed work of masonry, comprehending a semi-elliptical face, with circular flanks, mounting thirteen heavy guns, defended in the rear by an octagon tower of masonry, mounting six guns.

Alexandria: Some progress had been made in the construction of works in 1795, but an unfavorable report upon the plans caused the project to be abandoned.

Norfolk: Fort Nelson, on the western side of Elizabeth River, begun in 1794, extensively repaired and improved in 1802-1804, and again repaired in 1808, was an irregular work, defended by whole and half bastions, built of brick and sods, inclosed in the rear by a brick parapet, mounting thirty-seven guns. *Fort*

Norfolk, on the northeastern side of Elizabeth River, a thousand yards distant from Fort Nelson, erected in 1794-1795 and rebuilt in 1808-1809, was an irregular inclosed work of masonry, comprehending a semi-elliptical battery, defended on the flanks and rear by irregular bastions, mounting thirty heavy guns.

Hood's Point: Fort Powhatan, on James River, begun in 1808, was a strong battery of masonry, intended for thirteen guns, but unfinished in 1811.

Ocracoke Inlet: The foundation of a fort was laid on Beacon Island in 1794, but no further work was done; in 1799 an inclosed work was ordered on the ruins of the former work, but none was erected.

Wilmington, N. C.: Fort Johnston, on the right bank of Cape Fear River, twenty-eight miles below Wilmington, was originally a colonial fort. In 1794, a battery was erected on the site of the old fort, and in 1799-1800 some progress was made in constructing new works. Delays prevented the completion of the fort until after 1806. As finished, it was a flank battery of tapia, mounting eight heavy guns.

Beaufort: Fort Hampton, on Old Topsail Inlet, erected in 1808-1809, was a small inclosed work, mounting five guns.

Georgetown, S. C.: A battery was begun in 1794, but was abandoned because of the unhealthfulness of the site. *Fort Wingaw*, a small battery and block-house, was erected in 1809.

Charleston: Charleston was included in the projects of 1794 and 1798, but, since the State had not then ceded any sites to the United States, little was accomplished until the project of 1807. *Fort Johnson*, on James Island, *Fort Moultrie*, on Sullivan's Islands, at the entrance to the harbor, and *Fort Pinckney* were colonial or Revolutionary War forts. In 1794 Fort Johnson was ordered repaired and foundations for forts were laid at Forts Moultrie and Pinckney. Work was soon suspended, except for a battery (*Fort Mechanic*) in Charleston, which was completed by the mechanics. In 1798-1799 the old works were repaired and improved but were practically demolished by an unusual storm in 1804. As rebuilt under the 1807 project, *Fort Johnson* was a marine battery of irregular form, built of brick and wood, mounting sixteen guns; *Fort Moultrie* was a brick work of irregular form, presenting a battery of three sides on the sea front, with the whole inclosed with ramparts, parapets, etc., mounting forty guns; *Castle Pinckney* was a brick work of elliptical form, with two tiers, mounting thirty guns; *Fort Mechanic (Mechonric)*, on the point of the city, crossing its fire with that of the Castle at nine hundred yards, was a temporary masonry battery, falling into decay; in *Charleston* was a brick arsenal.

Beaufort, S. C.: Fort Marion, a work of tapia, circular of form in front and a straight line in rear, was begun in 1809 but was unfinished in 1811.

Savannah: Fort Green, on Cockspur Island, near the mouth of Savannah River, erected in 1794-1796, was an irregular work, with a battery. In 1804

the works were totally destroyed and a part of the garrison drowned in an unusually severe storm. *Fort Jackson,* at Five Fathom Hole, in a marsh on the west side of Savannah River, three miles below the town and twelve hundred yards from the nearest dry land, begun in 1808, was an inclosed work of masonry and mud, mounting six heavy guns.

St. Mary's (Point Petre): A battery of timbers, filled with earth and inclosed with pickets, was erected in 1799-1801 but was abandoned before 1804. Included in the 1807 project, no work had been accomplished because no site had been secured.

New Orleans: Fort St. Philip, at Plaquemines, on the eastern side of Mississippi River, thirty-two nautical miles from the mouth, an irregular work of brick built by Governor Carondelet in 1793, was acquired in 1803 in poor repair and rebuilt as an inclosed work of masonry and wood, mounting twenty guns. At *English Turn,* on the ruins of some French works, an inclosed work, with two bastions and a battery of masonry, for nine guns, was built in 1809-1811. When acquired in 1803, *New Orleans* was surrounded by five redoubts—Forts Burgundy, St. John, and St. Ferdinand in the rear, and Forts St. Louis and St. Charles in front, all dilapidated—connected by a line of ditches. *Fort St. Charles,* immediately below and at the northeast corner of the city, was restored as an inclosed redoubt of five sides, of masonry and earth, mounting nineteen guns. On the site of the Spanish *Fort St. John,* on Lake Ponchartrain, at the mouth of Bayou St. John, a strong battery of six guns, commanding the approach to New Orleans by way of the lake, was erected under the 1807 project.

The war with England brought about additional construction, and the acquisition of Florida in 1819 added to the ports and harbors to be defended. As a result the following new fortifications appear in the war and post-war years: Fort Lewis, New York; Craney Island, Virginia; Fort Scott, Point Petre, Georgia; Fort Marion San (Marco, or St. Mark's), Florida; Fort Barrancas, Florida; Fort Bowyer, Mobile Point; Pass Christian, and a number of lake and river forts.

In 1819, while a new coast project was in process of formation, the coast and inland forts were manned by the following garrisons:

Station	*Guns*	*Commanding Officer*	*Organization*	*Aggregate Strength*
Fort Sullivan, Maine	4	Lieut. Merchant		
Machias, Maine	4		Det., Corps of Arty.	39
Fort George, Maine	9	Capt. Leonard	1 Co., Lt. Arty.	70
Damariscotta, Maine	3			
Edgecomb, Maine	6			
Georgetown, Maine	6			
Fort Preble, Maine	14			
Fort Scammel, Maine	15	Bvt. Major Crane	1 Co., C. of Arty.	98
Old Fort Sumner, Maine	5			
Fort McClary, Maine	10	Bvt. Lt. Col. Walbach	2 Cos., C. of Arty.	195
Fort Constitution, N. H.	36			
Fort Pickering, Mass.	6			
Gloucester, Mass.	6			
Fort Sewall, Mass.	8	Bvt. Lt. Col. Harris	1 Co., Lt. Arty.	70

Fort Independence, Mass.	42			
Fort Warren, Mass.	12	Bvt. Lt. Col. Eustis	5 Cos., Lt. Arty.	390
Boston, Mass. (2 batteries)	14			
Plymouth, Mass.	5			
New Bedford, Mass.	6			
Fort Wolcott, R. I.	28			
Fort Adams, R. I.	17			
Fort Hamilton, R. I.		Bvt. Lt. Col. Towson	2 Cos., Lt. Arty.	146
Fort Green, R. I.	6			
Dumplins, R. I.	10			
Fort Griswold, Conn.	12	Capt. McDowell	1 Co., Lt. Arty.	53
Fort Trumbull, Conn.	18			
Fort Hale, Conn.	6			
Fort Columbus, New York	60			
Castle William, New York	102			
Fort Lewis, New York				
Fort Wood, New York	24	Lt. Col. House	Corps of Arty.	345
Fort Gibson, New York	14			
Castle Clinton, New York	28			
Humbert Battery, New York	16			
Fort Gansevoort, New York	12			
Sagg Harbor, New York	6			
Fort Mifflin, Pa.	37	Major Biddle	1 Co., C. of Arty.	121
Fort McHenry, Md.	30	Col. Hindman	1 Co., C. of Arty.	118
Fort Madison, Md.	13	Capt. Reed	1 Co., C. of Arty.	103
Fort Severn, Md.	6			
Fort Washington, Md.	19	Lt. Col. Jones	2 Cos., C. of Arty.	123
Fort Nelson, Va.	37	Lt. Col. McRea	Corps of Arty.	88
Fort Norfolk, Va.	30	Lieut. McIlvain	Corps of Arty.	50
Craney Island, Va.	20			
Fort Powhatan, Va.	13			
Fort Johnston, N. C.	9	Lieut. N. G. Wilkinson	Corps of Arty.	10
Fort Hampton, N. C.	5			
Fort Wingaw, S. C.	6			
Fort Johnson, S. C.	16			
Castle Pinckney, S. C.	30	Lieut. Washington	Small det., C. of A.	
Fort Mechonric, S. C.	7			
Fort Moultrie, S. C.	40			
Fort Marion, S. C.	6	Mil. Stork'p'r McCall		
Fort Jackson, Georgia	6			
Fernandina, Amelia Island		Capt. Payne	Corps of Arty.	222
Fort St. Mark's, Florida		Major Fanning	C. of A. and Inf'y.	108
Fort St. Charles de Barancas		Major Brook	C. of A. and Inf'y.	77
Fort Charlotte, Alabama			C. of A. and Inf'y.	46
Fort Bowyer, Alabama				
Fort St. Philip, La.	20	Major Humphreys	1 Co., C. of Arty.	85
Fort Petit Coquille, Lake Ponchartrain			1 Co., C. of Arty.	34
Bayou St. John, La.		Major Maney	1 Co., C. of Arty.	57
Fort St. Charles, La.				
Sackett's Harbor, New York		Col. Brady	Inf. and 1 Co., C. of A.	432
Greenbush, New York		Capt. Worth	Inf. and 1 Co., C. of A.	99
Fort Niagara, New York		Lt. Col. Pinkney	Inf. and Corps of Arty.	4
Detroit, Michigan Ter.		Major Marston	Inf. and 1 Co., C. of A.	169
Mackinow, Michigan Ter.		Capt. Pierce	1 Co., C. of A., and Inf.	131
Fort Scott, Georgia		Capt. Donoho	C. of Arty. and Inf.	75
Fort Gaines, Georgia			C. of Arty. and Inf.	13
Newport, Kentucky		Capt. L. Scott	1 Co., C. of Arty.	31

Military Situation of France's African Colonies

By 1st. Lieut. J. S. Robinson, C. A. C.

AFRICA, although it is the second largest of the continents, until recent years has been the least known. The main reasons for this condition are four: first, it is almost entirely within the tropical zone and much of the coast is extremely unhealthy for Europeans; second, it has a very regular coast line and but few good harbors or jumping off places to serve as bases for expeditions to the interior; third, the entire continent is a high plateau whose edges roughly parallel the coast at distances varying from a few miles to several hundred miles, thereby rendering nearly all African rivers valueless as useful routes to the interior; fourth, the northern section through which we would normally think penetration should come, has been held by peoples practicing a religion, militant Mohammedanism, hostile to our civilization, and in so far as the remainder of Africa is concerned could be considered an island shut off as it is by the Sahara, the Libyan, and the Nubian deserts.

Althought France has been interested in Africa since the Fourteenth Century, she has acquired her African empire since 1815. At the close of the Napoleonic Wars she held no colonies. Interest in Africa had been created by Napoleon's Egyptian campaign and furthermore it was about the only continent available for conquest. After the loss of Alsace Lorraine her interests were further intensified and these interests were encouraged and furthered by Germany until the latter began to acquire colonies of her own. At present she controls nearly half of Africa, an area of over 5,000,000 square miles, containing a population of more than 35,000,000.

These colonies are the islands of Reunion and Madagascar, French Somaliland, French Equatorial Africa, French West Africa, the Cameroons held under mandate, Algeria, and the protectorates of Tunis and Morocco.

As only about 5,000 of the 170,000 inhabitants of Reunion are not of French descent and it is governed as an integral part of France, it will not be considered in this discussion. Let us now consider the remaining colonies beginning with French Somaliland and continuing in a clockwise direction around the coast.

French Somaliland is a small colony about the size of Connecticut. It has a population estimated at from 50,000 to 200,000 who claim to be of Arabic descent. Its importance to France lies in the port of Jibuti, which is the only French coaling station on the East Coast and which is also the head of the only railway to Abyssinia, over which nearly all the trade of that country with the outside world is carried. This railway is owned by a French company. Although there have been several attempts to stir up the Somalis against the French, these have all failed. The reason for this is the French leave the

natives, except along the railroad, strictly alone and suffer no outside interference within the colony.

Madagascar is, after North and West Africa, France's most valuable colony. It is about as large as Texas. The coast is very regular and there are few good harbors. The interior is a high plateau cut up by mountains. A forest belt of from twenty to seventy miles in width, containing many valuable hardwoods, runs around all but the southwest section, which is very arid. There is considerable mineral wealth, principally gold, iron, and graphite. The climate of about one-seventh of the island is similar to that of the temperate zone and nearly the entire island is suitable for European colonization.

The population is about 3,500,000, of whom 20,000 are French. The native tribes, the principal one of which, the Hova, formerly ruled the island, are of Malaysian stock. There is but one language spoken. The French after their conquest of Madagascar left much political power to the Hova. They used this power to create an anti-French nationalist sentiment which culminated in 1916 in a plot to poison all the French on the island. The French therefore took away all political power from the Hova and started encouraging the other tribes. They have also recently started extensive secondary education, making school attendance compulsory between the ages of eight and fourteen. They are attempting through these schools and otherwise to create French sentiment. French colonization is encouraged but is very slow. Materially, the French have done much for the island. They have built carriage roads all over, a railway from Tananarivo, the capital, to Tamatave, its port, and public buildings and works over all the island. They have done much to improve agriculture, the principal industry of the island. All this has cost money and taxation has been disproportionately heavy. Madagascar like France is over officialled. A third cause of friction is religion, the Malagach religion being Protestant while that of official France either Catholic or non-existent. Although steps have been taken to improve conditions, there is still much discontent.

The value to France of Madagascar is: first, as a source of raw material; second, a source of man power in case of war; and third, as a colony suitable to French colonization. The Malagach was used during the war. They are very inferior soldiers and of small value as labor troops. The influence of the returning troops was bad. For defence of Madagascar, France depends on these Malagach troops, the fortified naval base of Diego-Suarez, and the intense dislike for foreigners of the native population.

French Equatorial Africa, comprising the four colonies of Gabun, Middle Congo, Ubangi-Shari, and Chad, is the least developed of France's colonies. The three southern colonies are dense tropical forest, the Chad savannes. Although these colonies have an area of nearly 1,000,000 square miles they have a population of less than 3,000,000, a decrease of over 1,000,000 in the past ten years, mainly due to sleeping sickness. A new port is being developed in the south from which a railroad is being built to Stanley Pool on the Congo, the principal trade route. The products of the southern colonies are timber, palm oil, rubber,

ivory, and cocoa. The Chad is a cattle raising country. It has no outlet for its produce and its development must await the trans-Saharan Railway. There is considerable copper in Babun, but the principal value to France of the colony is its timber. The big problem is the control of sleeping sickness.

The Cameroons, a former German colony, is held under French mandate. Its products and conditions are in the main similar to those of Equatorial Africa. The northern section of the Cameroons and much of Chad colony is suitable as to climate for white colonization.

French West Africa is about double the size of Mexico, and has a population of 12,500,000. It is bounded on the north by the 20° of latitude and on the south it encircles the British colonies of Gambia, Sierra Leone, the Gold Coast, and Nigeria, Portuguese Guinea, and Liberia. It should be noted that the English control almost the entire Gambia and Volta rivers and much of the Niger. They also control by far the best ports on the coast. They have leased the French two concessions on the Niger, one at its mouth, for commercial purposes. The climate and vegetation of the colony vary considerably. Most of the coast is low, unhealthy, and densely forested. The interior is the high African plateau cut up by mountains and rivers and bordering on the Sahara in the north. The native tribes, nearly all Mohammedan negroes, are grouped principally about the headwaters of the Senegal, Volta, and Niger rivers. The principal industry is agriculture; fruits, palm oil, ground nuts, rubber, cocoa, timber, and a little cotton are exported. There are but few good ports, the best one, Dakar, the capital, is being rapidly developed. Railway lines have been constructed.

This colony is of value to France for two reasons: first, manpower, and second, raw materials. The Senegalese are by far the best negro combat troop material in Africa. They have been fighting among themselves or against the Arabs and Berbers for over 1200 years. The French have no difficulty in maintaining of volunteer force of about 60,000. Upon the completion of railroad projects shown nearly 300,000 native will be available for service yearly.

North Africa, comprising Algeria and the protectorates of Tunis and Morocco, is France's most important colony. Physically these countries consist of a fertile strip of varying width along the coast, the high African plateau, the Atlas mountains, and the Sahara. The native population in each consists of Berbers, Arabs, and Jews. There are few negroes and almost no mixed negro bloods. The religion is Mohammedan. The principal industry of all three is agriculture. In all three colonies communications have been rapidly developed —first, roads for motor traffic, and secondly, railroads. Airplanes are used extensively for passenger, freight, and mail purposes, and in the desert for reconnaissance.

Algeria is divided into two sections; the northern section, nearly as large as Texas, has a total population of 6,000,000, one million of whom are Europeans; the southern section, nearly four times as large, has a population of 500,000, nearly all Berbers or Arabs. The northern section, although it has representation in the French Parliament is governed by a governor and council under

the French Minister of the Interior. The southern section is divided into military districts. The principal crops are wheat, barley, oats, wine, and olives. It has very valuable forests and considerable mineral wealth, principally iron and zinc. It is also a great sheep-raising country, an average of 800,000 sheep having been shipped annually to France during the war.

Tunis is a protectorate governed by a Bey, assisted by a French resident general. It has a total population of nearly 2,000,000, including 200,000 Europeans, mostly Italians, who by treaty have a preferential status and are able to keep their Italian citizenship. The principal crops are cereals, olives, and dates. Phosphates, iron, zinc, and lead are exported.

Morocco accepted a French Protectorate in 1912, for which privilege France paid Germany with two sections of Equatorial Africa which she has since recovered. Treaties and agreements with Spain, approved by the other powers, divided the country into three sections, a Spanish protectorate, the Tangier international zone, and a French zone about as big as France, with a population of over 4,000,000. The country is ruled by a sultan who is advised by a resident general. The government of Tangier has not yet finally been decided upon although France and Spain only recently came to an agreement which has yet to be ratified by England and Italy. Tangier belongs more to French than to Spanish Morocco, and only the jealousy of England prevented her from getting it. Its present status is not satisfactory and it must eventually be taken over by either Spain or France. French Morocco is very mountainous, being crossed by five ranges of the Atlas mountains. The valleys between these mountains and the plains near the coast are very fertile. The principal exports are farm products, eggs, poultry, and cereals. Copper, lead, tin, and oil are known to exist. In Marshal Lyautey, the resident general from 1912 until 1926, the French have had one of the greatest colonial administrators of all time. Entering the World War with much of Morocco in revolt he succeeded by a system of political and military penetration in pacifying nearly the whole country, and while doing so actually released a large part of the French garrison and in addition sent over 70,000 Moroccan troops for service in France. During his administration over 900 miles of railroad and 1500 miles of roads suitable for motor traffic have been built. Contrast this to Tripoli acquired by Italy in 1912. In 1918 the Italians held two coastal towns and the Germans had a submarine base on the coast.

There have however been constant rebellions in Morocco and it is yet not completely pacified. Its people are very warlike and have always been more or less independent. The most serious rebellion—that of Abd-el-Krim—started in the Spanish zone in 1923. In 1925 Abd-el-Krim, relying on his communist friends in Paris whom he apparently believed could prevent action being taken against him, attacked the French. Early in 1926 he was finally defeated after a very hard fought and costly campaign. After his surrender a large number of his followers immigrated to French Morocco to get out of the Spanish zone. The conduct of his army, at no time consisting of more than

6000 troops, gives an indication of the worth of Berber troops to France in future wars.

In all three of these countries European immigration, especially French, is encouraged. Secondary education is promoted, as is the higher education of a very limited number of natives for civil positions. The French consider that higher education of more than those for whom positions are available is a mistake and a cause of discontent, in which connection they point out Egypt. In Algeria the French adopted the French legal code. In Tunis they adopted a combination of the French and Mohammedan codes. In Morocco the French code is for the French, the Mohammedan for the Mohammedans. This is by far the most satisfactory. In these three countries there is no color line; all are equal before the law. Marshal Lyautey summed up the situation when he said: "We do not regard these people as an inferior race but as a different race than ourselves." These three colonies constitute the home station of the XIX Army Corps, the regiments of which are composed of battalions of French and battalions of natives. This service has done much to promote good relations. It is the object of France to absorb these three countries into a greater France by means of education and common interests and through contact with a leaven of native French citizens.

The present value to France of these colonies is, first, manpower and, second, raw material and food. During the past war they furnished 260,000 combat and 140,000 labor troops. Their combined population is 12,400,000, approximately, which indicates that they should furnish about 1,200,000 available manpower for military purposes.

The general problems confronting France in Africa are: the control of the smuggling of arms, the liquor question, the control of tropical disease, the training of African troops, the exploitation of undeveloped portions of the country through improved communications, the adjustment of the status of Tangier to the satisfaction of Spain, England, and Italy, and the adjustment of Italian aspirations in Tripoli and Somali.

Arms can be legally imported only into Algeria. The presence of the Spanish and Portuguese colonies adjacent to North and West Africa, in which treaties relative to smuggling are not rigorously carried out, makes this a very difficult and continuous problem. Liquor has nearly as bad an effect on Africans as have firearms and although importation is restricted there is extensive smuggling which is very difficult to control. Sleeping sickness and other diseases have made great inroads in the native population, especially in the Congo. At present in nearly all the colonies there is a special medical budget. The French have realized, along with the English, that the wealth of Africa, especially tropical Africa, depends on the welfare of the native.

The training of African troops has long been a subject of dispute. The present French budget provides for the training of only about 200,000 Colonials, including Indo-Chinese, per year, and more funds are not available. Military training in mandated territories is prohibited. The majority of European

nations are opposed to use of African troops as it is against their interests. As it is in France's interest to use them she most certainly will.

Great steps are being taken all over French Africa in developing communications. Railroads and roads are being built. Special types of tractors and six-wheel cars are being extensively experimented with for use in the Sahara. Special types of small boats with engines using charcoal for fuel are coming into use on the rivers. Airplanes are being used extensively, especially in North Africa and in the Sahara.

Spain is not satisfied with her share of Morocco. She desires control of Tangier. Italy is dissatisfied with her African requirements awarded her after the war. She claimed a large section of French West and Equatorial Africa as far south as Lake Chad, and French Somaliland. She received a slight adjustment of the western Tripolitan border from France. She likewise believes she should have special rights, if not exclusive rights, in Tunis. It is very doubtful whether France will ever cede either any more territory, as by so doing she increases the probability of revolts which are liable to spread into her own territory, in addition to which neither Spain nor Italy have anything of value to give her in exchange.

FRENCH COLONIAL POSSESSIONS IN AFRICA

	Capital	*Sq. Miles*	*Population*
Reunion		970	172,190
Madagascar	Tanarive	228,710	3,471.010
French Equitorial Africa	Brazzaville	(982,050)	(2,845,930)
Gabun		121,860	388,780
Middle Congo	Brazzaville	150,290	581,140
Ubangi-Shari		208,220	604,640
Chad		501,680	1,271,370
French West Africa	Dakar	(1,883,960)	(12,640,700)
Senegal	Dakar	74,110	1,225,520
Guinea		95,220	2,028,320
Ivory Coast		121,980	1,545,680
Dahomey		42,460	842,240
French Soudan		648,480	2,474,590
Upper Volta		154,400	3,018,190
Mauritania		345,400	284,400
Territory of Niger		404,910	1,221,760
[1]Cameroon	Yaounde	166,490	1,500,000
Algeria	Algiers	(1,071,180)	(5,802,460)
Northern Territory		222,180	5,256,420
Saharan Territory		849,000	546,040
[2]Tunis	Tunis	50,000	2,093,940
[2]French Morocco	Rabat	213,000	5,400,000
Comoros		790	110,000
French Somaliland	Jibuti	5,790	208,000
[3]French Togoland		21,890	672,840
Sahara		695,000	254,000
Total in Africa		5,319,830	35,171,070

[1]Mandate. [2]Protectorate. [3]Attached to Dahomey.

PROFESSIONAL NOTES

Coat of Arms for the Harbor Defenses of Los Angeles

Shield: Parti per fess wavy *gules* and *azure*, in chief two angels habited of the second and *argent* and winged *or* proper and in base two keys in saltire of the fourth and third.

Crest: On a wreath of the colors (*or* and *gules*) a crescent *gules*.

Motto: Nosotros Los Defenderemos.

The escutcheon combines San Pedro (Los Angeles Harbor) and the City of Los Angeles, both of which are defended by the guns of Fort MacArthur, and is an excellent example of "canting" heraldry, Los Angeles being represented by the two angels and of symbolic heraldry, San Pedro being represented by the keys of St. Peter.

Los Angeles Harbor or San Pedro Harbor is in the lee of Point Fermin, which was a point of note with the early explorers. Cabrillo in 1542 named it "Bahia de los Humos," and it appears on the charts of Vizcanio, 1603, under the name of "Ensenada De San Andres." In 1734 the Spanish Admiral Gonzeles gave it the name of San Pedro, which name continues in use today. It was a regular loading and unloading place for vessels from the date of the founding of the Pueblo of Los Angeles in 1781. The motto refers to both the port and the city: "We shall defend them." On account of the Spanish origin of the community in which the Harbor Defenses are situated, the motto, "Nosotros los defenderemos," is in Spanish.

The crest pertains to the first organization to garrison these Harbor Defenses in 1917, the present 38th Company, Coast Artillery Corps, known in 1812 and the years following as Capt. S. B. Archer's Company.

Captain Archer was notified by letter from The Adjutant General, March 30, 1815, to report to the Secretary of Navy to receive instructions relative to the future service of his company of artillery. Under these instructions he proceeded to New York and reported his company to Commadore Stephen Decatur for service with his squadron then being fitted out for service against the Regency of Algiers.

On May 30, 1815, the squadron, consisting of the 44-gun frigate *Guerrière*, 38-gun frigate *Macedonian*, 36-gun frigate *Constellation*, and 7 smaller vessels, set sail from New York for the Mediterranean.

Captain Archer's Company of Artillery was split up in detachments for service on different vessels, of the squadron. Forty-six officers and men served on the U. S. S. *Guerrière*, the flagship of Commodore Decatur.

June 16, 1815, when in the Mediterranean off the Cape de Gat, the squadron fell in with and captured an Algerian frigate of 46 guns and between four and five hundred men, commanded by an Algerian admiral. She struck after a running fight of twenty-five minutes and after receiving two broadsides from the *Guerrière* which killed the admiral and about thirty of the crew. The prize was sent to Carthagena.

Continuing on, the squadron, on June 19, fell in with and captured off Cape Polos an Algerian brig of 22 guns and 180 men after a chase of three hours. After putting the greater part of the prisoners on board the captured brig she was also sent to Carthagena. The squadron then made sail for Algiers where it arrived on June 28. Here, under the threat of the guns of the squadron, the Bey of Algiers signed a treaty putting an end to the payment of tribute by American shipping.

From Algiers the squadron proceeded to Tunis and Tripoli where difficulties of a minor nature were adjusted, after which the squadron sailed for home arriving in New York in November, 1815.

Here the company was reorganized and outfitted in preparation to being transferred to Fort Bowyer (Mobile Point).

Scoring for Harbor-Defense Artillery

The following score has been adopted for seacoast guns and mortar batteries.

a. *A Component—hitting (record fire).*

(1) *For guns.*

$$A = \left\{\frac{H'}{P'S} + \frac{H''}{P''S}\right\} \times 12.5$$

(2) *For mortars.*

$$A = \left\{\frac{H'_1}{P'_1S_1} + \frac{H''_1}{P''_1S_1}\right\} \times \left\{6.25 + \frac{H'_2}{P'_2S_2} + \frac{H''_2}{P''_2S_2}\right\} \times 6.25$$

In this component—

S = Number of record shots.
H′ = Number of hits record shots, target parallel with towing vessel.
P′ = Probability of hitting, target parallel to towing vessel.
H″ = Number of record shots, target bow on.
P″ = Probability of hitting, target bow on.
Subscript 1 refers to one zone.
Subscript 2 refers to other zone.

b. *B component—accuracy (record fire).*

(1) *For guns.*

$$B = \frac{M + N}{2d} \times 40.$$

(2) *For mortars.*

$$B = \left\{\frac{M_1 + N_1}{2d_1}\right\} \times \left\{\frac{S_1}{S_1 + S_2}\right\} \times 40 + \left\{\frac{M_2 + N_2}{2d_2}\right\} \times \left\{\frac{S_2}{S_1 + S_2}\right\} \times 40.$$

In this component—

$$M = \frac{\text{P. E.}}{0.845}$$

$$N = \frac{\text{DPAE range (stripped of wild shots)}}{0.845}$$

d = Mean of actual range deviations of record fire.
S = Number of record shots.
Subscript 1 refers to one zone.
Subscript 2 refers to other zone.

c. *C component—time (record fire).*

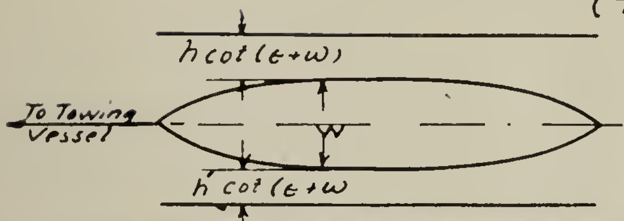
$$C = \frac{KS}{gt} \times 35$$

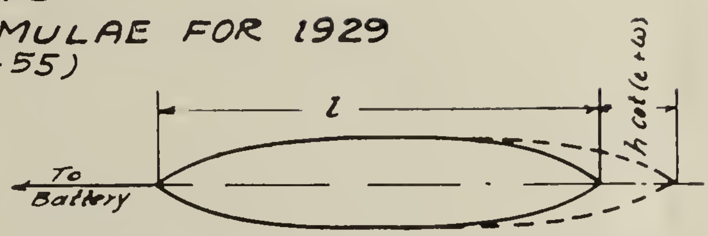
In this component—

K = Number of seconds prescribed as normal time for firing one shot per gun.
S = Number of record shots fired.
g = Number of guns firing.
t = Corrected time of practice in seconds.

d. *D component—penalties (record fire).*

SAMPLE OF SCORING
FOR
GUNS
ACCORDING TO FORMULAE FOR 1929
(TR 435-55)





Battery & Regiment	Sample		
Name & caliber of battery firing	Dodd, 12" B.C.		
Date	Jan 2, 1929		
Mean corrected range	11287		
DAPE (Range)	32		
DAPE (Direction)	9.5		
PE. (Table 1, TR 435-55)	65.6		
S = Record shots	8		
H' = Hits, Broad-side	3		
H'' = Hits, Bow-on	6		
Height of site (Yds)	2		
ϵ = Angle of site	01'		
ω = Angle of fall	10° 00		
h = Height of target above water (Yds)	10		
$\bar{h}$ = Height of target below water (Yds)	4		
l = Length of target (Yds.)	200		
W = Width of target (Yds)	33.33		
$h \cot(\epsilon+\omega)$	56.60		
$\bar{h} \cot(\epsilon+\omega)$	22.64		

$$A = \left[\frac{H'}{SP'} + \frac{H''}{SP''}\right] 12.5$$

HEADED IN DIRECTION OF TOWING VESSEL			
DS (Danger space) = $W + (h+\bar{h}) \cot(\epsilon+\omega)$	112.57		
Factor = ½ D.S. ÷ D.A.P.E. (Range)	1.759		
P' = Probability	.7645		
SP'	6.12		
H' ÷ SP'	0.49		
HEADED IN DIRECTION OF FIRING BATTERY			
DS (Danger space) = $l + h \cot(\epsilon+\omega)$	256.6		
Factor (Range) = ½ D.S. ÷ D.A.P.E. (Range)	4.009		
P''_R = Probability (Range)	.9930		
D.S = W (Direction)	33.33		
Factor = ½ D.S ÷ D.A.P.E. (Direction)	1.754		
P''_D = Probability (Direction)	.7632		
$P''_R \times P''_D = P''$	.7579		
SP''	6.063		
H'' ÷ SP''	0.99		
H' ÷ SP' + H'' ÷ SP''	1.48		
A = (H' ÷ SP' + H'' ÷ SP'') 12.5	18.5		

$$B = \frac{M+N}{2d} \times 40$$

M = PE. ÷ 0.845 (Line 7)	77.6		
N = DAPE ÷ 0.845 (Line 6)	37.9		
M + N	115.5		
d = Mean of actual deviations	78.1		
(M+N) ÷ 2d	0.74		
B = [(M+N) ÷ 2d] 40	29.6		

$$C = \frac{KS}{gt} \times 35$$

K = Normal time per shot per gun	45		
S = Number of record shots	8		
g = Number of guns	2		
t = Corrected time of practice in seconds	305		
KS	360		
gt	610		
KS ÷ gt	0.59		
C = (KS ÷ gt) 35	20.7		

Score = A + B + C − D	Actual	Allowed*	Actual	Allowed	Actual	Allowed
A	18.5	18.5				
B	29.6	29.6				
C	20.7	20.7				
A + B + C	68.8	68.8				
D	9.9	9.9				
SCORE	58.9	58.9				

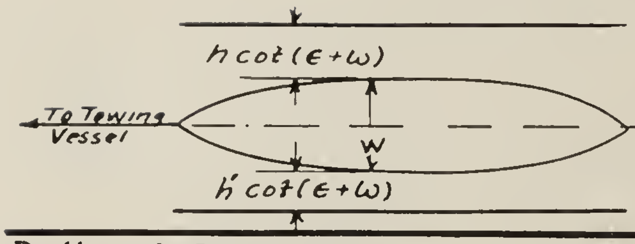
*NOTE
If the time per shot exceeds "K" the maximum allowable score for the "A" component is 25; for the "B" component, 40. If the battery is not adjusted at the end of practice, the maximum allowable score for the "C" component is 35.

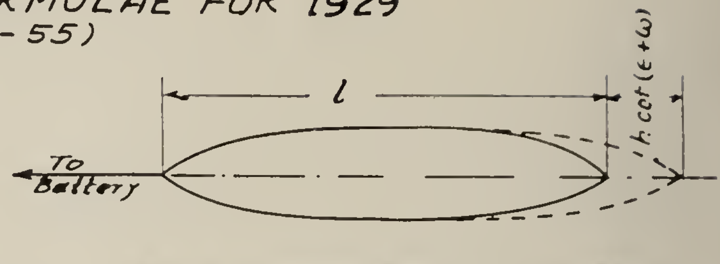
Coast Artillery Board
Fort Monroe, Va.
Dec 7, 1928

SAMPLE OF SCORING FOR MORTARS

ACCORDING TO FORMULAE FOR 1929

(TR 435-55)





Battery & Regiment	Sample					
Name of Battery Firing	Doe					
Date	Jan. 2, 1929					
Zone	VI	VII				
Mean corrected range.	6674	7563				
D.A.P.E. (Range)	46.5	44.8				
D.A.P.E. (Direction)	12	17				
P.E (Table I, TR 435-55)	47	51				
S = Record shots	8	7				
H' = Hits, Broad-side	3	1				
H" = Hits, Bow-on	2	1				
Height of site (Yds)	58	58				
ε = Angle of site	30'	26'				
ω = Angle of fall	59° 59'	65° 32'				
h = Height of target above water (Yds)	10	10				
h' = Height of target below water (Yds.)	4	4				
l = Length of target (Yds.)	200	200				
W = Width of target (Yds.)	33.33	33.33				
h cot(ε+ω)	5.66	4.56				
h' cot(ε+ω)	2.26	1.82				

$$A=\left[\frac{H_1'}{S_1P_1'}+\frac{H_1''}{S_1P_1''}\right]6.25+\left[\frac{H_2'}{S_2P_2'}+\frac{H_2''}{S_2P_2''}\right]6.25$$

HEADED IN DIRECTION OF TOWING VESSEL.						
D.S. (Danger space) = W + (h+h') cot (ε+ω)	41.3	39.7				
Factor = 1/2 D.S ÷ D.A.P.E. (Range)	.444	.443				
P' = Probability	.2354	.2349				
SP'	1.88	1.64				
H' ÷ SP'	1.59	0.61				
HEADED IN DIRECTION OF FIRING BATTERY:						
D.S. (Danger space) = l + h cot(ε+ω)	205.7	204.5				
Factor (Range) = 1/2 D.S. ÷ D.A.P.E (Range)	2.21	2.28				
P_R'' = Probability (Range).	.8643	.8762				
D.S. = W (Direction)	33.33	33.33				
Factor = 1/2 D.S. ÷ D.A.P.E. (Direction)	1.389	0.980				
P_D'' = Probability (Direction)	.6512	.4913				
$P_R'' \times P_D'' = P''$	.563	.431				
SP"	4.50	3.01				
H" ÷ SP"	0.44	0.33				
H' ÷ SP' + H" ÷ SP"	2.03	0.94				
(H' ÷ SP' + H" ÷ SP") 6.25	12.7	5.9				
A = Sum of both zones	18.6					

$$B=\left[\frac{M_1+N_1}{2d_1}\times\frac{S_1}{S_1+S_2}\right]40+\left[\frac{M_2+N_2}{2d_2}\times\frac{S_2}{S_1+S_2}\right]40$$

M = P.E. ÷ 0.845 (Line 8)	55.6	60.4				
N = D.A.P.E ÷ 0.845 (Line 6)	55.0	53.0				
M + N	110.6	113.4				
d = Mean of actual deviations	47.0	120.0				
(M+N) ÷ 2d	1.18	0.47				
S ÷ (S₁+S₂)	.53	0.47				
[(M+N) ÷ 2d] [S ÷ (S₁+S₂)]	0.63	0.22				
[(M+N) ÷ 2d] [S ÷ (S₁+S₂)] 40	25.2	8.8				
B = Sum of both zones	34.0					

$$C=\frac{KS}{gt}\times 35$$

K = Normal time per shot per gun	50		
S = Number of record shots	15		
g = Number of guns	2		
t = Corrected time of practice in seconds	525		
KS	750		
gt	1050		
KS ÷ gt	.714		
C = (KS ÷ gt) 35	25.0		

Score = A + B + C − D	Actual	Allowed*	Actual	Allowed	Actual	Allowed
A	18.6	18.6				
B	34.0	34.0				
C	25.0	25.0				
A + B + C	77.6	77.6				
D	3.5	3.5				
SCORE	74.1	74.1				

*NOTE: If the time per shot exceeds "K", the maximum allowable score for the "A" component is 25; for the "B" component, 40. If the battery is not adjusted at end of practice, the maximum allowable score for the "C" component is 35.

Coast Artillery Board.
Fort Monroe, Va
Dec 7, 1928

For each combined range-section and gun-section personnel error in range, for each combined range-section and gun-section personnel error in direction, for each wild shot, for each spotting error erroneously sensed, for each splash lost by the spotting section, for each adjustment or ballistic correction ordered applied in the wrong direction, and for failure to man the proper number of guns, certain penalties are applied.

As we go to press, we are in receipt of TR 435-55, Coast Artillery Target Practice, and find that certain of the values employed in working out the examples herewith have been changed, but the changes do not affect the methods of computation illustrated.

An Observers' School at Fort Mills

By MAJOR C. D. Y. OSTROM, C. A. C.

A School for Observers in the Harbor Defenses of Manila and Subic Bays was held at Fort Mills, P. I., during the period of July 1 to September 30, 1928. All men who were to act as observers for fire against naval targets during the coming target practice season were required to attend and no soldier was to be permitted to act in this capacity unless he satisfactorily completed the course in the school. In order to continue the instruction of these men along approved lines, a school for officers was instituted at which one officer from each firing battery was in attendance.

Instruction was given about one hundred and thirty men, both American and Filipino, whose training and experience varied from that of the well-trained, experienced observer to that of the man with no training along these lines. Training was restricted to practical instruction on the use of the instruments. The general scheme of instruction was to demonstrate and explain the proper method of performing a certain operation with an instrument, after which the men were given ample opportunity for practice in this operation under supervision of one of the instructors and were then tested in this one operation. Examples of these operations were: Leveling, adjusting level bubbles, parallax removal, orienting and adjustment for range using both the waterline and an artificial waterline. Upon completion of the separate tests a man was given a general test of all operations, including tracking.

Instruction was given first on the azimuth instrument, then on the depression position finder and the coincidence range finder. All men were given the complete course on the first two instruments and brief instruction on the last named with the exception that more intense instruction was given certain observers from batteries using coincidence range finders in their normal systems of position finding.

For training on the azimuth instrument, all men were consolidated into one group, being later divided into a Topside group and a Middleside group for test purposes.

For the depression position-finder training, the men of each battery reported for instruction at their battery observing station. This made it impossible for the officers to give all the instruction. Instruction was first given the most experienced observers of the battery and he in turn acted as instructor for the men in his battery. Two "test stations" were selected, at each of which one of the officers was stationed testing the men in the various operations as they reported by roster and at the same time giving such additional instruction to individuals as was required. The other officers went from station to station, supervising, questioning, and instructing during this period.

All men were given brief instruction on the coincidence range finder, while the observers of those batteries whose position-finding system contemplated the use of one of these were given more extended instruction and practice on the training instrument as well as on the coincidence range finder itself.

The final work consisted of a tracking test for each man on each type of instrument with a boat at such ranges as should be expected for practice.

Instruction given the officers' school was confined to the depression position finder. Its proper use is most important in these defenses. After instruction, each officer was required to perform the various operations laid down for the adjustment and use of this instrument.

Modified Gray Spotting Board

By Captain K. S. MacKirdy, 41st C. A.

Figures 1 and 2 are illustrations of a modified Gray spotting board which has been used by Battery A, 41st Coast Artillery, in five practices during the past two years. The

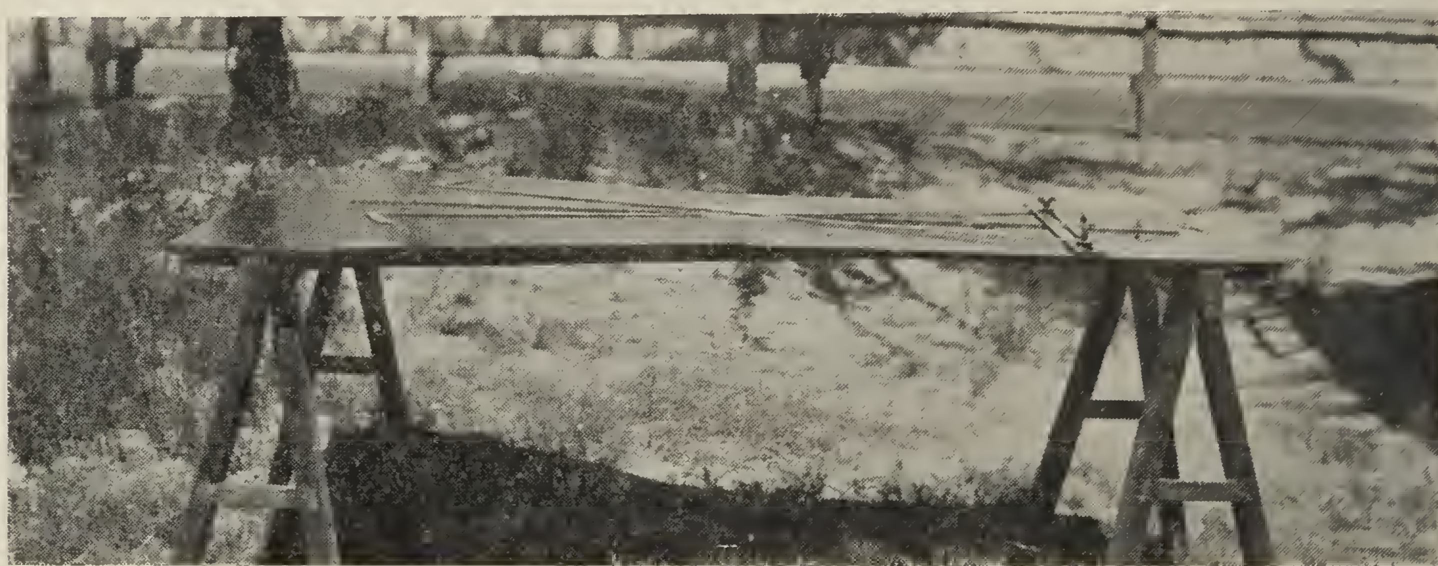


Fig. 1

board can be made to any convenient scale, but the board in the illustrations was made to a scale of four inches equal to one thousand yards, and for use by a mortar battery the

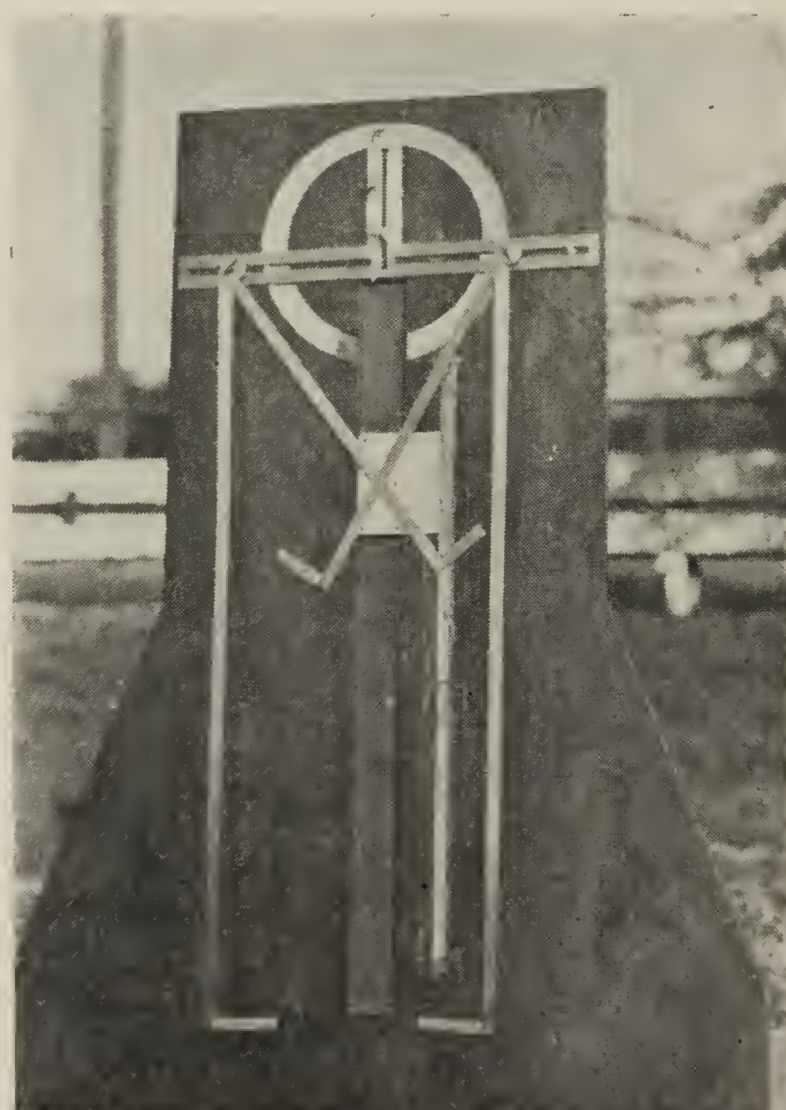


Fig. 2

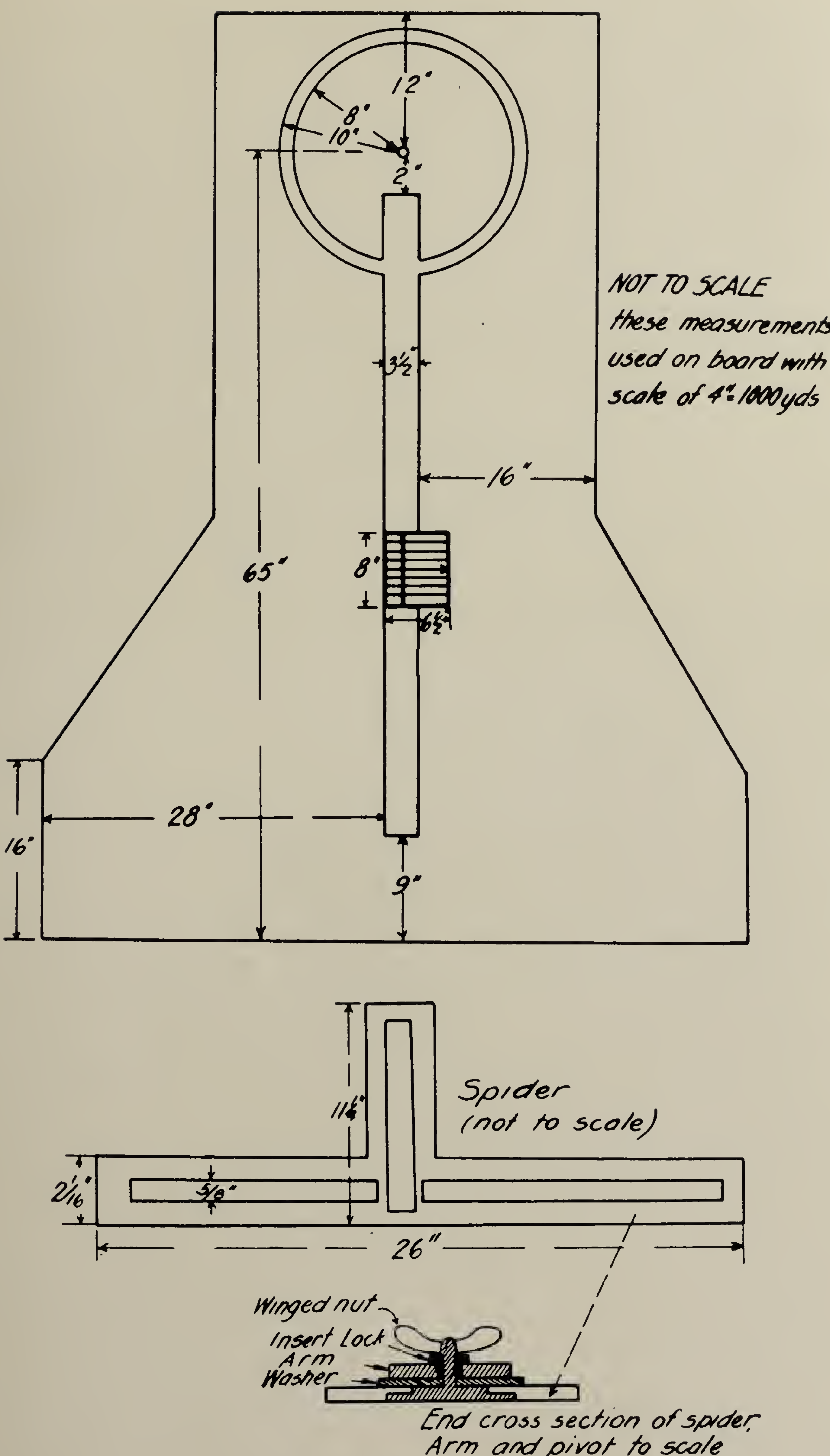

12"
8"
10"
2"
3½"
16"
8"
6½"
65"
28"
16"
9"
NOT TO SCALE
these measurements
used on board with
scale of 4" = 1000 yds
Spider
(not to scale)
11¼"
2 1/16"
5/8"
26"
Winged nut
Insert Lock
Arm
Washer
End cross section of spider,
Arm and pivot to scale

FIG. 8

scale was about right. As shown, there are two sets of arms: One set for subcaliber, one set for service.

This board in general follows the scheme laid down in T. R. 435-221, paragraph 42, except that metal arms are used in place of the strings and an adjustable spider is used in lieu of the board. By use of the metal spider the board is made universal and therefore may be used for any battery or set-up, provided the scale is of proper size. The pivots around which the arms swing are so made that they can be slid in the slot shown and then locked so that the rotation of the arms around their pivot do not loosen. The directing point is the center of the board, but since the spider is allowed to slide backwards and forwards when the winged screw is unloosened the set-up can be adjusted for the directing point in front of or behind the baseline.

On the ends of the arms are five-inch acrs, one inch in width, the center of which is normal, or three, to correspond with the scale in the azimuth instrument, one and two being on the right and four and five on the left as you face the center of the board. This arrangement permits of the most rapid working of the board, for once the block in the center is slid to the range and the arms crossed at the center line a pin is stuck in the board at the normal of each arc. The spotter sends in his reading as taken from the azimuth instrument scale and the arm quickly moved to the same reading against the pin. When both arms are set we read off the overs and shorts directly on the board, using colored inks to differentiate between them.

For the arms and the spider we used one-eight inch brass and for the board old flooring dressed down on the top. The legs were made from projectile crates thrown out on the salvage pile. The legs are saw horses which fit into joices on the under side of the board.

The azimuth circle is inlaid, into which a piece of linenback paper just fits to hold it tight. This must be changed for every considerable change of azimuth of the baseline. A point aids in setting the spider and can be seen on the face of same in upper part of picture pointing to the circle.

The sliding range block is made lopsided to allow of crossing the arms without covering the range scale. The center line has a pointer traveling against the range scale.

This board was found to be very fast, and with a little practice can be operated so that the results can be placed on a blackboard beside the spotting operator about the time one observer gets his report back in.

One drawback to the board is the fact that two observers, two armsetters, and a plotter are needed to operate the board. The board gives accurate and fast spotting at the expense of personnel.

This is submitted in the hope that it may be of some assistance to some battery in need of good spotting.

Fort Wood and the Statue of Liberty

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Fort Wood is situated on Bedloe's Island, New York Harbor, and its site was named after Isaac Bedloe. In 1667 Governor Nicolls referred to Bedloe's Island as the "largest of our Oyster Islands." Governor Lovelace in 1669 issued a commission for Isaac Bedloo [Bedloe] and a year later conferred special privileges upon Love Island, which later became known as Bedloe's Island and is so called today.

On August 10, 1670, Lovelace gave the new name of "Love Island" to a "Certaine Little Island in ye Bay neare this Citty comonly called Oyster Island" for which Bedloe had had a patent granted by Col. Richard Nicolls and the Island was made a "Privileged place where no Warrant of Attachmt or arrest shall be made of force or served unless it be by ye Governors Speciall Warrant in Cases of breach of ye peace or Cryminall Mattrs."

The island was originally one of the possessions of the Colonial Government of New Amsterdam and during the Revolutionary War called Kennedy's Island after Captain Kennedy, commander of the British Naval Station of New York who purchased it from the trustees of Mary Smith, a daughter of Bedloe, for 100 pounds. In 1750 it was sold to New York for a pest house site and in 1800 the state gave the island to the Federal Government. The present star-shaped fort was constructed in 1841 at a cost of $21,300. Guns were mounted on the parapet and a garrison of approximately 350 men was stationed on the Island.

In recent years the United States Army Signal Corps has maintained a laboratory at the fort but this was abandoned on December 1, 1922, and at present Fort Wood is garrisoned by "B" Company, 16th Infantry.

The real history of Bedloe's Island began about 1877 when it was designated to be the site of the Statue of Liberty.

Soon after the Franco-German War, during which the Americans had given many substantial proofs of sympathy to France, a party of men eminent in letters and politics, among whom were Laboulaye, Lafayette, Jules de Lasteyrie, Paul de Remusat, Waddington, Victor Borie, Leduc and Bartholdi, conceived the idea to unite, at the approaching one hundredth anniversary of the Independence of the United States, with their political friends in America in a joint demonstration.

It was proposed to present the people of America at the celebration of the great event with a token of friendship in the shape of an exceptional monument glorifying the union between the countries. The plan was adopted, and Frederick August Bartholdi, a young French sculptor, who had already given proof of exceptional talent, was sent to America to confer with prominent patriots and admirers of the French about the project. On his entering New York Harbor he was so deeply impressed with its natural beauty and grandeur that he conceived the idea of raising a statue symbolizing "Liberty Enlightening the World" on one of the islands in the beautiful bay. At night a resplendent aureole upon its brow should throw out upon the sea beams of light, greeting the newcomer and reminding him that he comes to the "Land of the Free." Bartholdi proposed a plan for the monument which was accepted.

On the recommendation of President Hayes, a joint resolution was passed by Congress on February 22, 1877, authorizing the President to set apart a site for the statue on Bedloe's Island and to provide for its maintenance and to except the statue when presented by the French people.

A committee was formed in 1874 to raise funds for the construction of the statue. The Monument of Independence, as it was called, was to be executed by two peoples, the French furnishing the statue and the Americans the pedestal. One hundred and eighty cities, forty general councils, many societies, and thousands of people contributed to the statue. The New York *World* used its vast influence and circulation, and by a stirring appeal succeeded in raising $100,000 for the pedestal fund.

The total cost of the statue and pedestal was about $1,000,000.

The head of the statue was completed for the Paris Exposition in 1878, and the following year all necessary funds were obtained for the statue.

The forearm was completed and sent to America and shown at the Centennial Exposition in Philadelphia in 1876. From there it was sent to New York and reposed in Madison Square until 1886, when it was taken to Bedloe's Island.

On October 24, 1881, the anniversary of the Battle of Yorktown, all the pieces of the framework and base were put in place in Paris. Levi P. Morton, U. S. Minister to France, drove the first rivet of the first piece which was to be mounted. The statue was completed in 1883. On July 4, 1884, M. deLesseps, President of the French Committee, officially presented the statue to Minister Morton.

In the latter part of June, 1885, the French vessel *Isere* from Rouen, France, having aboard the statue in 210 cases, sailed into New York Harbor accompanied by the North Atlantic Squadron.

The cornerstone of the pedestal was laid on August 5, 1884. The work of putting the statue together was commenced in May, 1886, and completed in October of the same year.

Invitations were sent out on the occasion of the unveiling of the Statue of Liberty by the President of the United States, on October 28, 1886, signed by John Schofield, Major General, U. S. Army, Commanding Division of the Atlantic.

An Object Lesson

It is as impossible for a nation to acquire absolute immunity from all war, as it is for an individual to acquire absolute immunity from all disease. The best a nation can do is to build up its power of resistance in a way that will discourage attack and minimize the danger from any assault that may be attempted by another power. In trying to do that, it ought to take to heart the fact that the individual who undertakes to ward off disease does so by keeping himself in a state of robust health and developing his fighting powers both actual and potential. He doesn't go out looking for trouble. He lives a sane, sensible and as far as possible peaceful life, avoiding contact with hostile germs, but he keeps himself fit and ready for trouble if it comes his way. And in case he does get into a row with a bug or two, the odds are that he will win out handily in the engagement that ensues.—*Detroit Free Press.*

For Fast-Moving, Hard-Hitting Armies

A board of army experts, appointed last spring to make a special study of modern military equipment and of its uses in future warfare, in its report to Secretary Davis urges the formation of a highly motorized and mobile striking force, to consist of light and speedy tanks of a new type, armored cars, powerful tractor-drawn trucks, automobile artillery, and, last but not least, infantry on wheels.

The suggestion originated in experiments carried out under the board's auspices, and it envisages a force in which properly coordinated elements of the various land fighting services could keep pace and cooperate with the fast-moving tanks. Other nations, among them the British and the French, have recently made similar tests, with the difference that in some of them, cavalry and aviation also were brought into play.

Studies of this kind are particularly significant in our day. The question of maximum mobility and striking power is likely to be of paramount importance on the battlefields of the future. For that matter, this has always been true of warfare. A complex aggregation of qualities went to make up the military genius of Napoleon, but perhaps none of them contributed more to the winning of his victories than this ability to get the utmost speed and offensive out of the fighting equipment at his disposal. He was usually a jump or two ahead of his enemies, and then he hit them hard.

Since Napoleon's day a vast series of changes has occurred in military equipment, and while the infantry still marches on foot and cavalry still moves on horseback, the fleet flying machine, the tank and motor transport make it necessary to devise entirely new modes of collaboration among the diverse units of an army in action. It is still the rule, as it was in Napoleon's time, that victory goes to the faster-moving and the harder-hitting army.—*Detroit Free Press.*

War Cure

The problem of putting an end to war is the most puzzling and difficult one before the nations, and the one whose solution would bring the greatest amount of blessing to mankind if actually solved. There is, however, much reason to fear that it can be solved only

through an alteration of some of the fundamental characteristics of human nature, and that until such an alteration can be achieved, the best civilization can do will be to try to make wars as few and as far between as possible, and minimize their horrors as much as may be practical.—*Detroit Free Press.*

A Misplaced "But"

In one of the accounts of the life of Marshal Cadorna it was written "he had the record of being a strict disciplinarian, but impartial." There never was a "but" more out of place. Any old soldier, whether from the ranks or not, could tell the writer of that sentence that the very essence of discipline is impartiality. Imitations of discipline may be produced by commanders who play favorites, but they will not stand much inspection or a severe test. —*New York Sun.*

Emergency Officers' Retirement Act

Brigadier General Frank T. Hines, Director of the U. S. Veterans Bureau, has announced that 7,576 claims for retirement under the Emergency Officers' Retirement Act have been received by the U. S. Veterans' Bureau of which number 1213 have been settled, retiring with pay 708 officers, retiring without pay 40 and disallowing claims in 465 cases.

The Director pointed out that there appears to be a misconception on the part of some of those interested in the administration of the law, with respect to those officers actually entitled to retirement within the purview of the statute. This, it was explained, is due in a large measure to the fact that a list of all former officers then rated by the Bureau as 30% permanently disabled irrespective of the provisions of the law under which their disabilities were connected with service, was printed in the Congressional Record previous to the passage of the Act, and it was assumed by many that the list represented the actual potential beneficiaries. However, the Emergency Officers' Retirement Act as passed by Congress limited its benefits to those officers having a disability resulting directly from service and incurred in line of duty, leaving without its scope those men whose disabilities are presumptively connected under the provisions of the World War Veterans' Act and the War Risk Insurance Act.

"To establish a claim under the Emergency Officers' Retirement Act," the Director continued, "the former officer must show that he has a disability resulting directly from service and incurred in line of duty, or show that a disability which pre-existed his service as an emergency officer was aggravated as a direct result of such service and incurred in line of duty, and that such disability be rated in accordance with the Bureau's Schedule of Disability Ratings 30% permanent."

"The Retirement Act provides that its benefits shall be applicable to those 'who have been or may hereafter within one year be rated in accordance with law at not less than 30% permanent'. There has been considerable discussion as to the proper interpretation of the words 'who have been rated' many veterans believing they were to be automatically retired if they had ever been rated 30% permanent or more. The Comptroller General, however, has decided that 'It is apparent the intent of the act is that only those who have a permanent disability entitling them to a rating of 30 per cent or more under the schedule of ratings are entitled to retirement under the act of May 24, 1928, and if in any case the description of the disability upon which an award has been made by the Veterans Bureau suggests that the disability may now be less than 30 per cent, it is competent for the Director, in his discretion, to require the medical examination provided by the World War Veterans' Act in order that the rating accorded may be "in accordance with law." In order to determine finally under what interpretation of this phase of the law payments may legally be made, the Bureau has submitted the question of the retroactivity of this provision to the Attorney General and the Comptroller General.

"The interpretation of the words 'resulting directly from service,' as referring to the claimant's disability, is of cardinal importance to the former officer," continued General Hines, "as benefits under the Act may be granted or denied according to the interpretation determined upon, therefore, the Bureau has presented this entire question also to the Attorney General soliciting his opinion."

"The Retirement law gives the Emergency Officer a period of one year ending May 24, 1929, within which to apply for retirement and requires that the Bureau rate those entitled to retirement with pay in that period. This is a feature of the Act which does not appear to be generally known. Retirement pay is effective retroactively from the date of receipt of the application in the U. S. Veterans' Bureau, Washington, D. C., regardless of when the retirement is approved. In the consideration of these claims, a reasonable amount of time must be devoted to a detailed study of each to insure that complete justice is accorded the officer as well as the Government. Before this study may be made it is frequently necessary to obtain additional evidence such as a more detailed description of the disabilities and a separate report must be obtained from the War or Navy Department in each case. While the securing of such additional evidence necessitates some delay it has also resulted in retirement being granted in many cases which, lacking this evidence, would have been disallowed."

General Hines concluded: "The Bureau has adopted, insofar as the Retirement Act permits, the same liberal attitude which has characterized its administration of the World War Veterans' Act and other legislation for the benefit of the disabled veteran. While some important questions vital to the former officer are under consideration by the Attorney General and the Comptroller General, decision in cases contingent upon these questions. must necessarily be held in abeyance, but the Bureau's organization for the administration of the Act is such as to enable it to adjudicate all cases well within the statutory time limit. "In fact," said the Director, "it is anticipated that we will be able to dispose of all retirement claims before the expiration of the time allowed."

Anti-Militarism in Switzerland

A spirit of communism disguised in part as pacifism, socialism, and acute antagonism to the military establishment of the republic, has been gaining headway in Swtizerland ever since the close of the world war. Its latest manifestation is a publicly announced combination of teachers of the primary public schools of Zurich and Geneva having for its purpose propaganda advocating total military disarmament, abolition of the military budget, and inculcation of this doctrine in the minds of children attending the public schools.

In this connection, attention is invited to an article written by Lieutenant Frederick Brawand, of the Swiss army, which is published in the September 15 issue of the *Journal Militaire Suisse*, an extract from which is here given. What this officer has to say about anti-military propaganda in the primary schools applies not only to Switzerland but also to the instructors in some of our own educational institutions. Lieutenant Brawand says:

"A number of anti-military school teachers claiming to be actuated by 'love of the fatherland' demand the abolition of the military budget and complete disarmament of Switzerland. These persons also entertain the thought of calling into being an international anti-military association. These teachers, all of whom earn their stipends in the service of the state, are engaged in antagonizing that state. Are we to entrust our youths. the youths who will at some time become, as we are today, responsible for the security of the state? It is inconceivable that teachers who lay claim to be cultured and intelligent can publicly advocate such an absurdity. No one endowed in any degree with a rational mind will assert that our army endangers peace. It is the army that guarantees peace. Swiss neutrality has its only security in the army, and disarmament would jeopardize that.

"When Switzerland entered the league of nations it declared that it would maintain the invulnerability of its domains with its own resources and without foreign assistance.

Thanks to this declaration Switzerland is relieved from any action of the league of nations in its behalf. Maintainance of the army is for us, in our situation as an intermediate European state, a vital question. As soon as we are found incapable of protecting ourselves with our own resources the great neighbors of our immediate environment must, for their own protection, be prepared to take into their hands the strategic thoroughfares of our country. There can be no doubt of this and it ought to be comprehensible even to one who has no grasp of the military situation.

"The demand of the teachers of Geneva is plainly an attack against the security of the state. The teachers of Zurich declare, in a letter to their colleagues in Geneva: 'You indicate clearly and emphatically the incompatibility of war and the school.' This expression, which is one of many similar phrases uttered by them, has no sense of reason and is only evidence of means by which they endeavor to support their contentions. There are no schools in Switzerland where love of war is taught. If the teachers mean by 'war' recounting the deeds of our ancestors they commit a crime against our manhood. Youth has not only the right but it is its duty to know the history of our fatherland and that knowledge is incumbent upon them as a duty. To inspire love of the fatherland one must know the deeds of the men who built it up and handed it over to us. That is only one of the purposes of our schools. The schools must train true citizens of Switzerland and not youths devoid of all sense of home and of all knowledge of their country because its history is kept from them systematically by a dead silence in regard to all that relates to the struggles of those who rendered possible its existence, under the pretext that they must not be taught military history. The history of our country is sacred and if it is to endure the youths of today, the men and women of tomorrow, must have a clear comprehension of what the fatherland really stands for and must know that what they call the fatherland today is the gift of their fathers who protected this land with their bodies and acquired it with their blood. I need not allude to the hoary past to bring into light the deservedly disgraceful conduct of these teachers. . . . What must the more advanced of their pupils think of a teacher who antagonizes the institutions of the state. They are sowing the seeds of communism while they talk about love of country. They are undermining the faith that animates our children and teaching them that what the fathers did is reprehensible because they engaged in wars and engaging in wars is horrible. War is certainly horrible but the army is the only agency that can protect us from its horrors. Our army is an instrument of peace and its purpose is to maintain law and order. He who attacks it attacks the security of the state. We certainly have never had greater occasion to be gratified with having made timely provision for military preparedness than was the case from 1914 to 1918. Our army then saved us from foreign invasion and all its resulting horrors. . . . The problem for the government of a land like ours that is surrounded by warlike and war-conducting powers is, in time of war, the most difficult imaginable, and it is the duty of every citizen to yield his personal inclinations and interests to the common good. Switzerland must be ready at all times to defend its flag, the symbol of a glorious and honorable past."—G. R.

Motor Vehicle Driver's Licenses for Military Staff Officers

A writer in the *Militär-Wochenblatt* of October 25, 1928, has this to say on the subject: "The World War has been almost forgotten by the younger generation and many lessons that we might have learned from it have not been utilized. When we had penetrated Belgium by a three days' march we could see passenger motor vehicles which had been abandoned by the enemy standing about. How often these cars could have been made useful to us if we could only have found competent drivers for them. I was on the staff of a reserve division that was very sparingly supplied with passenger cars and we would have been very glad to have our supply of such vehicles increased, but among the officers with the staff not a single one had been trained as a motor vehicle driver. After hours of search through a war strength brigade we succeeded in finding two reservists who had

sufficient confidence in themselves to undertake to attempt to drive one of these abandond automobiles. It took them only ten minutes to get the car started and they continued to drive it for several days with great glee when they again abandoned it because they had found another which they liked better. I found this very mortifying and became then convinced that every officer of the higher staff grade ought to be required to possess a motor driver's license. During the progress of the war many young staff officers took it upon themselves to overcome the need of drivers by simply taking the drivers seat on a vehicle and going ahead, but this gave rise to so many break-downs that the supreme general staff issued stringent orders that no one should be permitted to drive a motor car unless he had a driver's license.

"The writer desires to invite attention to the embarrassing situation in which any officer using a motor vehicle for his transportation is placed when he is wholly dependent on the driver, if the driver is killed or wounded or becomes helpless in any other way. The use of automobiles has been greatly increased in the army since the war and modern war demands that every staff officer using one should be required to acquire a driver's license. Furthermore in view of the fact that large bodies of troops are likely to be transported by motor vehicles it is desirable that every officer should be a competent driver in order that he may be able, in an emergency, to replace a disabled car or truck driver, even momentarily. In order that all officers may be trained as motor vehicle drivers it is essential that all service schools be provided with automobiles and with competent instructors to teach drivers, and it should be required that competence as a driver be included in the officer's final examination.—G. R.

Insuring Secrecy of Confidential Documents

A writer in the October 25 number of the *Militär-Wochenblatt* states that, pursuant to an order of the Chief of Staff of the French army, all general staff officers must from this time on be able to use typewriting machines. By this they are to be made independent of the services of typists, male and female, and thus insure more fully the secrecy of general staff communications and reports. Secrecy of all documents affecting preparation for war is an obvious necessity. It is also indisputable that modern mechanical writing and duplicating appliances add increased difficulties to efforts for keeping writings secret. One or more generations ago, when everything was still written with the pen and every document had to be written over as many times as there were copies required, keeping the contents secret involved slight difficulties, but even the process of taking letter-press impressions increased the chances of contents of writings becoming known to persons not intended to be acquainted with them.

The German writer here enters into a discussion of measures that should be taken to ensure the secrecy of confidential documents from which the following extracts are given.

As a general rule only rigid, vigilant, and incessant supervision is effective in preventing betrayals of confidence in situations where dependence must be placed in individuals who may be subjected to temptations prompted by large pecuniary considerations, by threats of blackmailers who have succeeded in trapping and entangling their victims into compromising situations, and by other means. The assumption that an infrequent but unanticipated and unexpected surprise investigation is the proper expedient to ensure safety does not hold; it is evidence only of the carelessness of the supervising agency. Only systematic supervision regulated by frequency but not depending for its exercise upon any fixed dates of hours or days or opportunities prevents irregularities. Surprise actions succeed only in disclosing irregularities after the mischief has already been done.

Precautionary measures affecting persons preparing and handling confidential documents must be rigorous, uninterrupted, and have an element of distrust not only of invisible spies but also of the individual under supervision. The supervising service must also be

itself subject to supervision and there must be established everywhere the possibility of seeing that all rules for securing secrecy are at all times strictly observed. It is much more difficult to keep surveillance of the writing machine than of the penholder. The criminal expert may be able to determine that a document has been written by a certain machine but *who wrote the document* has been very seldom established. Typewriter carbon copies are especially dangerous; the carbon paper with which copies are made can also be the culprit; it now fills the role formerly taken by the letter press copy.

It is self-evident that trustworthy personalities are the best protection against the disclosures of confidential communications, but not everyone is an expert judge of human nature. Higher authorities must not content themselves with issuing orders and regulations to prevent disclosure of confidential documents, they must take measures also to see that those regulations are strictly observed and any violations visited with severe penalties.—G. R.

Electing to Fight

Hamilton Fish is author of the latest proposal that war be declared by popular choice. A constitutional amendment requiring a declaration of war to be ratified by the qualified electorate of the country has the fancy of Congressman Fish, who has put it up to the house. It is not a new idea among custodians of the peace. As an instrument for hamstringing the nation in an emergency the measure has been considered by pacifists.

It may be remarked that there is no machinery for a national referendum. The ballot is in the hands of the individual states, with the state legislatures alone empowered to call an election. Should congress declare war and look to the people for acceptance or rejection, some of the states might elect to vote on the matter, others might not. The presumption that at such a crisis none of the states would hesitate to furnish the avenue for popular expression has no value in the proceedings. The federal government would be extemporizing election machinery instead of looking to its defenses.

As a formula the Fish schemes are liable to superficial acceptance. The theory is that the people furnish the materials of war; let them decide whether they want to fight. Furthermore, it is argued that the time consumed in arranging for a referendum would serve to cool the passions and that several millions of people are less likely to be provoked into hostilities than a few hundred. If the declaration of war were ratified, it is further contended, there would be more whole-hearted support in the battle, once it was undertaken at the direction of the majority. These are assumptions founded upon the notion that the citizens of the United States are strictly logical persons, dictated by dispassionate values which will exist in times of high national excitement. This is not the case.

Actually the war fever of the electorate is higher and their spirits more volatile than that of their representatives. In any war which the United States may undertake there can be no doubt that under the Fish arrangement the majority would approve it. The only advantage would be an advantage to the enemy in a delay of mobilization and preparation when hours are precious. At such a time it is to be hoped that not America but the enemy is engaged in a referendum. While bombs are wrecking New York speakeasies it is not inconceivable that the Kansas assembly would be debating the calling of an election.

There are other considerations. In the event of popular ratification by a small margin the national dissension would be a serious obstacle to the efficient prosecution of war. A recount on petition of the minority is not unthinkable, and members of the minority would have some justification in claiming exemption from service on the ground that they voted no. A strong case could be made out for the rights of the minority.

Intelligent advocates of the popular referendum on declarations of war are confused in failing to appreciate the condition of the public mind when war threatens and in expecting too much of the ballot.—*Chicago Tribune.*

Nations as Policemen

While the United States is discussing the treaty renouncing war as an instrument of national policy, and considering a moderate cruiser program, a Vienna dispatch calls attention to the fact that ten small states of Eastern Europe have 1 million men under arms, and repeatedly several of them have been on the verge of war in the last year. Perhaps it is well to remind ourselves of the address of Theodore Roosevelt before the Sorbonne in Paris in 1910, which was read in the ceremonies at his grave on the tenth anniversary of his death:

> It is the duty of wise statesmen, gifted with the powers of looking ahead to encourage and build up every movement which will tend to substitute some other agency for force in the settlement of international disputes. The great civilized peoples must keep ever in mind that in the last resort they must possess both the will and power to resent wrong-doing from others. The men who sanely believe in a lofty standard preach righteousness, but they do not preach weakness, whether among private citizens or among nations.—*Kansas City Star.*

Now for the Cruisers

The multilateral treaty renouncing war as an instrument of national policy is one of a great number of pledges the United States has given of its desire for peace, pledges its acts have amply sustained. Its pacific disposition has not prevented other nations from making war against it. The nation's insurance of safety lies in adequate preparedness, and a navy as strong as the country's territorial and commercial necessities dictate is the minimum essential of adequate preparedness.—*New York Sun.*

Foreign Periodicals

Militär Wochenblatt, June 4, 1928

Ranges of Fire. By Lieutenant Colonel Benary. There is a tendency toward increase of range in all arms. One needs a long arm to seize the opponent opportunely in these days of marching and fighting formations echeloning in depth, but one frequently overshoots the target. Moral effect is balanced against and over actual effect and technical disadvantages. Moral success is undoubtedly greater when the range of our arms is greater than that of our opponent. We had proof of this at the beginning of the war in the West because the range of the French field guns exceeded ours. We artillerists stood helpless when their projectiles struck into our infantry and we were unable to touch the enemy batteries with our shorter-ranging guns. The actual effect of their fire was slight at those long ranges but the moral effect on our infantry was none the less greater and their censure of our artillery well justified. The Russians had the same experience when our projectiles reached them at ranges greater than that of their guns. The writer enters into details of changes in gun construction that are necessary to effect excessively long ranges such as increased weight of guns and carriages, increased length of barrels, and other things and argues whether or not the advantages of increased range so gained are not, at least to a considerable extent, discounted by the greater difficulties of ground observation of impact of shots fired at extreme ranges which usually overshoot the targets aimed at and cause but slight damage.

Formal Drill in the German Reichs Army. A writer on this subject states opinion is gaining ground that former rigid close order drill in barrack yards, especially when required of soldiers of long service, does not conform to the manifold requirements of modern fighting methods and is a waste of time and should be replaced by training in loose open

order in terrain exercises. There is a division of opinion on this subject, but the reactionary supporters of continued close order drills, which they claim is the best agency for implanting in the man a proper sense and appreciation of discipline, obedience and soldierly bearing, are losing ground.

Horse Statistics in Germany. By "M. K." Notwithstanding the introduction and increasing use of motor power draft it is surprising to note, from statistics of a census taken by the national government, that the number of horses on hand December 1, 1927, was more than at the same date in 1913. The maximum was reached in 1925 and there has since been a slight annual decrease—from 3,916,000 in 1925 to 3,805,000 in 1927. But statistics of horses by ages show that the annual reduction for years to comes will be materially greater than it has been since 1925 because the census shows a very great preponderance of horses between 5 to 9 and over 9 years old. There were on hand at that date horses less than 1 year old, 129,000; between 1 and 2 years, 187,000; 2 to 3 years, 255,000; 3 to 5 years, 553,000; 5 to 9 years, 1,175,000; over 9 years, 1,503,000. This seems to indicate that horses now on hand that are approaching and have reached, and in some cases passed, the period of maximum serviceability will pass away much more rapidly than they will be replaced by younger horses coming on to take their places.

The "Register" of the National German Army. (Reichswehr.) Shows the army as of May 1, 1928. Its distribution is: Two major army group commands, one in each defensive area, 7 division commands in defense district, 3 cavalry division districts. The army comprises 21 infantry regiments, 18 cavalry rgiments, and 7 artillery regiments. There are, in addition, 7 engineer (pioneer, sapper, miner,) battalions, 7 communication (intelligence) motorcycle detachments, 7 sanitary detachments, 4 schools of arms, 3 military smith instruction depots, 2 central and 1 auxiliary munition supply centers, and 7 ammunition supply establishments. The unusual preponderance of cavalry to infantry, as compared with armies of other military powers, is due to conditions imposed on Germany by the treaty of Versailles.—G. R.

Militär Wochenblatt, June 11, 1928

German Major Attack in May, 1918. By "105". Conclusion of an article on this subject begun in a previous issue.

Training Questions. By Lieutenant General von Metsch. Continuation of his writings on this and kindred subjects begun in previous issues. Discusses in this number changes in conduct of operations in war since close of the World War due to improvement and development of fighting weapons and necessary changes in fighting methods resulting therefrom. Points out what he considers errors in fighting training systems now going on. He warns the commander of troops about to engage in an attack that he cannot count on being left undisturbed by his enemy during several hours of preparation in these days of air-observed long-range artillery fire, tank and airplane made smoke screens, machine-gun placements, gas, mines, all pushed forward with motor appliances. Only that method of managing an attack has value that takes account of all these agencies of enemy counter activities, even though it may be that enemy's plan to offer passive resistance to the main attack only. Tanks have long since ceased to be the *ultimo ratio*, the last deciding reserve of the leader. The modern fight stands in all its zones and phases, from advance long range reconnaissance to pursuit *in the sign of the motor.*

Modern Armament and Equipment of the Infantry. By Field Marshall von Ostrymiecz, former Austro-Hungarian army. The last war introduced a series of improved fighting appliances that training, armament and equipment must take into account. One of the most securely grounded rights is that of custom—being accustomed to a thing or manner of procedure. In ante war times the rifle of the infantryman was one of the most important questions of army armament. Designers and manufacturers of this weapon were continually engaged on its improvement and a rifle that had been in use as much as ten

years was considered antiquated and to be replaced. The infantry rifle with which nearly all armies entered the World War was, ballistically very efficient, had an average effective range of 2000 meters, and was capable of rapid fire. War experience showed that the attribute of accurate and rapid fire, although utilized to a certain extent, gradually became exceptional, especially in mass fire. Artillery and machine guns began to relieve the infantry from long-range fire and assigned them to rapid fire in mass in close combat action. Such it became in the war, and present conditions of weapon technique tends toward a fair probability that rapid infantry mass fire will, in the future, be limited to close combat, and achievement capability of the future infantry rifle will probably be founded on this phase.

The writer enters into an interesting discussion of the question of caliber, weight, length of barrel, and form and weight of bullets that will engage the attention of future rifle manufacturers. He touches also on the rifleman's other equipment—hand grenades, spades, steel helmets, gas masks, camouflage appliances—all of which are pressing for solution and arrives at the conclusion: In the search after new fighting means that shall substitute the machine for the man, it must not be forgotten that in all processes of mechanization the foot soldier is finally still the carrier of the fight who will bring the decision in future wars.

Subsistence Supply of the German Army in the World War and the Present Reichswehr. By Colonel Benary. Measures for supplying a modern army must be as carefully considered as its military operations and care in this matter cannot be neglected in peace. An evidence of the excellent manner in which this problem has been and is being solved is presented by the "Exposition" "Supply of Reichs Army" now on exhibition in Berlin. In this "Exposition" the system applied in supplying the gigantic army of the World War naturally attracts the greater attention. We old front-line soldiers are reminded of the achievements of our supply organization which made it possible for every man of the army, from quiet rearmost rest stations up to the squad in a shell crater of the extreme front, to obtain necessary subsistence even though it may, in such instances, have been only a fist full of sausage and hard bread and a snifter of something to drink, and this in spite of all impediments including the starvation blockade to which our home regions and its people were subjected.

In comparison with army requirements of past ages attention is invited to the following figures of the quantities of subsistence supplies shipped from the home country to armies in the field during the war: 2,924,125 head of beef cattle; 1,122,296 sheep; 1,386,214 swine; 3,337,703 tons flour; 1,032,285 tons potatoes. All this aside from supplies of the same kind obtained from the countries occupied by the army and exclusive of immense quantities of dairy products, fresh and processed vegetables, fresh and preserved fruits, and delicacies sent from home by friends and relatives, supplies of malt, vinous, and other alcoholic beverages, canteen supplies, and the other minor components of the ration—coffee, tea, cocoa, sugar, salt, vinegar, etc., all of which came from home. The value of components of the daily ration allowance of the soldier of the present Reichswehr is 22.5 cents U. S. currency and of the bread ration 5¼ cents. The ration is computed at 3604 calories, compared with the World War ration of 3454 and the ante war ration of 2900 calories. The "thrown together" soldiers' meal of former times has disappeared and the men now are served soup, meats, potatoes, and vegetables in separate courses as neatly prepared and placed on the table as would be expected at any well-managed restaurant. Attention is also given to peculiarities of tastes of local regions of the country in preparation of cooked foods. The Wurtemburger may have his "spätzle" and the East Prussian his "Konigsberger klops."—G. R.

Militär Wochenblatt, June 18, 1928

The French Army Organization. By General von Taysen. Writer comments in considerable detail on the main features of the new French army reorganization the point

of departure of which, he says, is simply that reduction of the period of service of the enlisted soldier was a parliamentary exaction to which the government had to give way. The gist of his views is contained in the closing paragraph of his writing: "One thing is, at any rate assured: The one-year term of service does not prevent France from giving every man capable of bearing arms thorough training nor from bringing into action in war in a short time the maximum of military power that can, under modern circumstances, be brought to the assistance and support of the fighting army at the front. It is the key word of the French parliamentary circles and of the French press that: 'He who does not perceive that the French army serves only purely defensive purposes and is not capable of undertaking aggressive measures or measures tending toward conquest, is blind or malevolent.'" General von Taysen thinks that it would be easier to prove the opposite of this contention.—G. R.

Militär Wochenblatt, June 25, 1928

Crossing Rivers, Modern Processes and System of Construction. By Lieutenant Colonel Klingbeil. The form of fighting incident to forcing river crossings have undergone a change due to the effect of long-range artillery and the introduction of air observation into the fighting field. The element of surprise formerly played the main role on the part of the attacker, but this has, for reasons stated, been made much more difficult or almost wholly eliminated. There remains now only persistent and well-executed concealment of preliminary preparations and employment of strong forces to resist the enemy's measures for protecting the river banks. Crossing may be effected in daytime but actual construction of the bridge is restricted to night work. Rapid action is the trump card in all such enterprises. The writer discusses various methods for effecting crossings and the appliances required, which are now being studied and tested.

Training Questions. By Lieutenant General von Metsch. Writer in continuing his articles on this subject takes up in this issue "Modern Cavalry." "The publication of the excellent study of 'Army Cavalry in the War of Movement' by General von Borries was suggested by me principally because during my service as inspector I occasionally heard expressions of contempt for the achievements of the cavalry, as recounted in histories of the World War and a feeling of pessimism in regard to the future of the mounted arm, even from its adherents. That is not only unjustified but extremely detrimental to training. When young men growing up as prospective cavalry leaders are frequently told that their arm was only an out-of-date remnant of a fighting device that has seen its day, the effect cannot but be hurtful. Neither does one give encouragement by exposing the many disappointments disclosed by history that have been brought to our knowledge superficially only and without considering at the same time whether or not the failures of the cavalry concerned were due to deficient training or inappropriate and inadequate armament. One must also remember that in the last war, the war of position, continuing through several years, practically paralyzed the activities of the mounted arm." The writer refers to many instances when the cavalry of the allies as well as that of the central powers rendered excellent service in the war notwithstanding the disadvantages to which it was subjected. He also notes that the French have, in their new army reorganization, not reduced but increased the percentage of cavalry to other arms.

The New French Infantry Regulations. By General von Taysen. Writer takes up and comments on many details of these new regulations and finds in them, on the whole, progressive improvement. Among these he cites: "Above all the introduction of the machine-gun company has also experienced material change by reason of the increased accomplishment of the light machine gun; subordination of heavy machine-gun sections to the infantry, as heretofore prescribed, ceases. Since the new light machine gun has, as is assumed, the same qualifications up to 1200 meters as the heavy machine gun itself, an end is to be made of scattering the machine-gun company into parts and this company will, from now on, be used by the battalion for its own definite purposes—assembly and concentration of

strong fire power against fixed targets, long-range fire, indirect fire, etc." The writer also states that in some cases the new French regulations overcome faults and deficiencies in existing German regulations that he has heretofore had occasion to criticise.

Rubber for Shoeing Horses. By Lieutenant Colonel von Wolf. Great advances have been made in production and working up of rubber. This raises the question whether or not rubber can be used as a substitute for iron in horse-shoeing. Have any experiments in this direction been made? It would be of interest to gain information on this subject. The movement of horses on hard cement paved roads is becoming difficult and soft surfaced roads are becoming rare, and in war movement on hard paved roads will be much more frequent than they are in peace exercises. The advantage of rubber would result in sparing horses' hoofs and legs and in closer and better fitting from the veterinary's point of view.

In reply to this inquiry the editorial management submits the following: "In regard to the problem of hoof protection it may be stated that rubber horseshoe fittings were undertaken long before the war. A cast was made of the interior of the hollowed out hoof and a soft mass which soon congealed was pressed into this hollow. The hardened cast of rubber was then sent to a hard rubber factory which prepared from this cast rubber insertions. These were placed under the iron shoes and held fast to them by means of four iron plates projecting over the sides. The plates were extended under iron shoes and thus held fast the rubber insertions. The hoof irons were not complete iron shoes of the old pattern but hollowed out only underneath in U form. Into this hollow there was driven a short, well-tarred piece of cord so that the pressure on the horse's foot was comparatively softened and the inner hoof was also protected in mountain riding over rocky terrain. This process could not be applied to decayed frogs. For war purposes we naturally discarded this somewhat difficult process but were able to keep up valuable horses much longer, in peace, than would have been possible without it."—G. R.

Militär Wochenblatt, July 4, 1928

Conduct of War and Politics. In the leading article in this issue General von Kuhl, German army, retired, enters into an argumentative discussion of an essay published in pamphlet form by Professor Hermann Oncken on "Politics and War." The outstanding feature of Professor Oncken's work is his contention that when a nation is at war with another, politics, by which he means the civil administrative branch or department of the government as distinguished from the military branch, must step aside and give way to the military because war can be successfully conducted only by a military head charged with full power and responsibility—under one single head—a practical dictator as was the case with Frederick the Great, Cromwell, and Napoleon; that the civil (political) branch cooperates and places its resources at the disposal of the military but is in a sense subordinate to that in the direction of policies while the war is going on. It is conceded that the civil administration decides whether or not a war shall be begun and also when and how it shall end, but while war is in progress the military leader—naturally the chief of staff—should have control as representative of the sovereign or executive of the state. General von Kuhl takes the opposite view and holds that, especially in these days when war has become an affair requiring to the utmost every resource of the nation, the civil administration must have an equal voice in its conduct and policy while it is going on. In the course of his argument General von Kuhl gives publicity to many occurrences and incidents that arose on this very question during former wars in which the Germans were engaged, that have heretofore been unknown involving bitter and far reaching controversies between the chief of the German general staff and his assistants and the head of the civil administration of the government—von Moltke and Bismarck in 1866 and in 1870-71, and Ludendorf and Bethmann-Hollweg in the World War. Only a careful reading of the whole of General von Kuhl's writing, as published in this number of the *Militär Wochenblatt*, can furnish

an intelligent understanding of his views and arguments on the very important question under discussion which has not as yet been and probably never will be satisfactorily solved.—G. R.

Militärische und Technische Mitteilungen, May-June 1928

Captain Ernest Wisshaupt begins this number with an interesting article giving in narrative form an outline of the operations of the combined German and Austro-Hungarian forces against the Russians after the battles of Tannenberg and the Masurian lakes in East Prussia in September, 1914. In the opening paragraph he says: "Never was the element 'uncertainty' as greatly predominant as it was in the autumn campaign of 1914. Numerous interceptions of Russian radio messages were of great assistance in penetrating the veil but in spite of this the allied leaders were continually confronted by problems solution of which involved far reaching consequences. The picture of the enemy situation was subject to almost hourly changes."

Colonel Alfred von Dragoni, former Chief of the General Staff of the Austrian XII Corps, takes up, with a similar description, an outline of the operations of the Austro-Hungarian army in seizing and occupying the Russian Ukraine against the disorganized Bolshevic bands during the war, in the winter of 1917 and the spring and early summer of 1918. The territory covered by these operations extended through the whole of southern Russia, the shores of the Black sea and sea of Azov, beyond the Dneiper, and almost to the Volga. When, in the summer of 1918, the exhaustion of the Austro-Hungarian government foreshadowed its early breakdown and the troops were withdrawn, the whole region was again occupied by the Bolshevics. After the departure of the Austrian troops the struggle against the Bolshevics was again taken up by the so called "white Russians" under Generals Wrangel, Korniloff, Petlura, and others. The writer gives a graphic description of military operations of which very little has heretofore been known. The article is accompanied by an excellent outline map of the regions traversed by the contending troops.

Constructing and Placing a Bridge of Boats over a river subject to flood high waters and making it available for three months' service during intervals of high, medium, and low water. This is given in the nature of a practical problem to be solved and worked out by a company of pontoon bridge engineers in a definitely fixed time. The proponent of the problem supplies a list of all the material that will be needed, the composition and distribution of the personnel of each kind to be employed in the construction with equations of stresses to which certain parts will be subjected, and working drawings in vertical, cross, and horizontal sections of portions of the structure while in process of construction, all of which is profusely illustrated in an appendix accompanying the article.

Development of Artillery Material During and Since the World War. Major Heigel, former Austrian Army, retired, continues in this issue articles on this subject which he began in the November-December 1927 number. He takes up in this May-June, 1928, issue the "Heaviest Guns on Gun Carriages in Fixed Positions." He states that this would include (if we exclude naval artillery) fortress artillery of inland fortifications and coast artillery but for his present purpose with reference to this article, his interest is only in such of the latter as can be made serviceable in land warfare, such as the 42-cm. coast howitzers and the 35-cm. guns used in the World War. Guns like the heavy high-angle fire cannon in movable carriages adapted to land warfare form today a separate class which, as long as the question of caterpillar artillery has not been solved free from all objections, predominate now as they have heretofore. The classification of the heaviest guns—used for siege purposes, we said, before the war—is quite new because mobility was limited to long-range guns of 15-cm. caliber. As a matter of fact, the probability of calibers over 15-cm. was found so difficult for solution that the French, Germans, and English placed such guns on railway gun carriages on the West front, which was practicable on account of the dense net work of railway lines there. Hence, we have now in all armies only a few of this class of guns whose application is possibly independent of railway lines. Of these, three among

modern guns are known to us: the Italian 152-mm., then our [Austrian] former 24-cm., and finally the 220-mm. French M 17—the 240-mm. St. Chaumond being classed as obsolete.

If, under the influence of change of points of view after the war we ask today the purposes of those guns, they would scarcely be classed as siege guns for modern warfare. We now need powerful long-range guns in order to be able to fire with readily movable cannon, that are not dependent on railway carriages, against vulnerable places far in the enemy's rear.

After these preliminary remarks the author enters into detailed description and discussion of the construction, character, and adaptability of heavy guns with comments on and criticism of their merits, weak points, and deficiencies and refers, here and there, to projects for their modification and improvement that are now in progress or contemplated. The text contains drawings showing details of construction of some of the guns mentioned and photographs of them in firing position and in place ready for being moved. Among the guns thus referred to are the Italian 152-mm. L/45 "*Sul Affusto A Coda*"; the Austro-Hungarian 24-cm. gun, M 16; the French 220-mm. gun, M 17, system Schneider, which is shown by four photographs and three drawings which Major Heigel says were courteously furnished to him by "Direction d'Artillerie, Paris, and by Messieurs Schneider & Cie."

Coming now to the United States the author uses the heading: *The American 16-Inch Seacoast Gun* and says: "It is not my intention to handle here seacoast guns but inasmuch as an exception has been made with respect to the American 40.6-cm. L/50 gun, I have departed from this course only because of a desire to indicate, by an example taken at random, what has been newly created since 1919 and also because, under the urgent pressure of war conditions, several of such very heaviest and presumably immovable seacoast guns were nevertheless sent to the front. Thus we [Austrians] placed the 35 Naval barreled "George" in position at Levico, with expenditure of very great efforts, in order to place the Italian corps headquarters under fire at Asiago in May, 1916. The Italians also had in readiness some very fine 38-cm. weapons at Ansaldo.

"The Americans were still building their heaviest disappearing guns well into the beginning of the war period. America was the land of disappearing gun carriages which are today doomed to extinction in this age of indirect fire and air observation squadrons. After the war they returned to the usual form of gun carriages—barbette they called them—and so evolved the 16-inch gun for protecting their most important harbors and the Panama canal, with the declared intention of exceeding in range all existing naval guns.

"That the Americans have succeeded in attaining their 50-kilometer range is largely due to the fact that they took advantage of the lesson taught by the Professor Rausenberger 21-cm. German long-range gun. By raising the elevation of their 16-inch gun to the maximum of 65° they send the projectile, in the greater portion of its trajectory, through the rarified higher atmosphere."

The author then gives a detailed description of the 16-inch gun and its principal characteristics, together with a photograph of the gun in firing position. To this he adds:

"There arises, in connection with this gun, for us also an important and interesting tactical question involving land defense. The gun stands wholly free and exposed on its traversing plate without armor of any kind. There are, for immovable targets, only two possible protections, armor or concrete or, still better, excellent camouflage. Since one intends or is compelled to dispense with the two first named there remains only the last. In most of the flat level surroundings of the emplacements for these guns it is practical to provide concealment for them from enemy fleet visibility by planting trees. The danger referred to applies to this gun and to every battery of its class with enemy fliers. How then, can this gun be camouflaged? A problem difficult of solution at a flat, level seacoast location. We can perceive, as far as is apparent to us from a distance, all the worries of seacoast defense but they are, nevertheless, confronting us with problems that are continually coming up to us in the field also—particularly with long-ranging cannon."

THE AUSTRIAN FEDERAL ARMY. M. Karl Vaugoin, the Minister for Army affairs, submitted to the parliament in February, 1928, a sixth annual report of his administration of the army. One learns from this report that the army is making satisfactory progress, notwithstanding budget retrenchments and the heavy restrictions imposed by the peace treaty. The relative number of officers is not greater than it is in other states notwithstanding the fact that a professional army needs more officers. In 1927 the army furnished troops to subdue disorders in the interior on three different occasions. It also rendered efficient aid in cases of conflagrations, traffic accidents, flood catastrophes, storm and tornado damages, earthquake, glacier and avalanche movements, and in other services for the common welfare, such as restorations after torrent overflows, construction and repair of roads and bridges, reforestation and drainage, services aggregating 123,000 working hours. Training is at a high standard. Building the pontoon bridge at Krems was a masterpiece of construction work, as was the laborious map work in the mountain regions. The relation of the army personnel to the population is the very best in all federal lands. Much progress is being made in placing soldiers, who have served their enlistments, in public civil service positions and also in promotion of the horse-breeding service. The minister alluded with trenchant criticism to the abusive attacks that have been made against the corps of officers of the army and emphasized again with glowing words the surpassing tradition of the old Austrian army and its renowned departed chief Conrad von Hoetzendorf.—G. R.

Rivista Aeronautica, September, 1928

PURSUIT PLANE, COMBAT PLANE, BATTLE PLANE. Gen. G. Douhet.

SECOND REPLY ON THE SUBJECT OF ARTILLERY AVIATION. Lt. Col. S. M. G. G. Castagna.

THEORETICAL AERODYNAMICS. Lt. Col. E. Raimondi.

THE POSSIBILITIES OF GLIDING FLIGHT IN THE ATTACK ON SURFACE SHIPS. Major V. Lega.

CONTRIBUTION REQUESTED OF AERONAUTS IN THE STUDY OF CLOUDS. Prof. C. Crestani.

AERIAL NAVIGATION INSTRUMENTS AND THEIR RATIONAL EMPLOYMENT. Engineer R. Ranalli.

THE 4-ENGINED SEAPLANE DORNIER SUPERWALS.

Rivista Marittima, October, 1928

TORPEDOES, TORPEDOCRAFT AND TORPEDO TUBES. Captain F. Costracane.

SUBMARINE CHASERS? Capt. I. Goiran.

TEST OF THE BALILLA CLASS OF SUBMARINE AT 100 METERS. Engineer A. Bezzi.

SURFACE TORPEDOCRAFT. Lt. Comd'r. C. Margattini.

VERTICAL AND HORIZONTAL PROTECTION OF VARIOUS TYPES OF WARSHIPS. Commander E. Bianco di S. Secondo.

Rivista Militare Italiana, September 1928

MILITARE NOTES ON THE MARECCHIA VALLEY. General Barbarich.

THE CROSSING OF THE TRENTINO ALPS BY PRINCE EUGENE OF SAVOY. Lt. Col. Pellegrino.

MOUNTAIN WARFARE. Major Scalise.

MILITARY CONSIDERATIONS OF THE ELECTRIFICATION OF RAILWAYS. Lt. Col. Stabarin.

Rivista Militare Italiana, October, 1928

A TYPICAL EXAMPLE OF A BATTLE OF PENETRATION: GORLICE-TARNOW. Colonel Trioli.

PREPARATION, STUDY AND DISCUSSION OF A REGIMENTAL TACTICAL MANEUVER PROBLEM.

MAY THERE STILL EXIST A BELLIGERENT RIGHT? General Bollati.

Rivista di Artiglieria e Genio, August-September, 1928

THE VISION OF FUTURE WAR. General Bollati.

LIMIT OF ERROR COMMITTED IN THE CALCULATION OF THE MOTION OF PROJECTILES BY NEGLECTING THE CONVERGENCE DUE TO GRAVITY. Prof. R. Serini.

FIRE AND MOVEMENT IN CAVALRY SCOUTING. A. P. Virex, Lt. Col., Holland Cavalry.

MILITARY TELPHER-WAYS. Col. A. Bellusci.

EMPLOYMENT OF A GROUP OF MOUNTAIN ARTILLERY ASSIGNED TO AN ALPINE UNIT. Col. V. Marango.

THE MECHANIZATION OF SAPPER-MINER AND TELEGRAPH UNITS wth reference to the technical maneuver in open warfare. Col. E. Cianetti.

NEW APPLICATIONS OF ELECTRO-MICROPHONE CIRCUITS. M. Conti.

MECHANICAL FUZES. Capt. M. De Angelis.

THE INTERNATIONAL RADIO CONVENTION OF WASHINGTON.

THEORETICAL CONSIDERATIONS ON THE CONSTRUCTION OF THE MUZZLE-BRAKE. L. Kazinczy.

NOTES ON THE DEFENSIVE ORGANIZATION OF THE VRIGNY-ANDRE SECTOR (Rheims, June-July, 1918). Captain G. Stellingwerff.

Revue d' Artillerie, September, 1928

THE COMBAT OF THE PETIT-MORIN (Continued). By Colonel E. Valarché, Retired.

THE ORGANIZATION OF ANTIAIRCRAFT BATTERIES—A critical study of the methods of fire. By Major P. Vauthier.

THE LIGHT HOWITZER IN FOREIGN ARMIES. By Major A. Pot.

THE MADSEN AVIATION MACHINE-GUN. By Major G. Morel.

A DEFLECTION ADJUSTMENT SCALE FOR UNILATERAL OBSERVATIONS. By Lieutenant P. Viry.

Revue d' Artillerie, October, 1928

THE WARS OF THE FIRST EMPIRE. THE WEARISOME PERIOD. By Colonel A. Grouard.

THE COMBAT OF THE PETIT-MORIN. By Colonel E. Valarché.

MEMORANDUM ON THE USE OF THE CORRECTOR IN FUZE-RANGE FIRING.

A DEVICE FOR SIMULATING ARTILLERY FIRE. By Major H. Viala.

Revue Militaire Française, September, 1928

THE BATTLE OF THE AVRE. By Major d' Argentieu.

THE ORIGIN OF THE NEW REGULATIONS OF THE MEDICAL DEPARTMENT. By Surgeon General Uzac.

CROSSING RIVERS IN THE PRESENCE OF THE ENEMY. By Colonel Baills.

A STUDY OF THE OFFENSIVE OPERATIONS ATTEMPTED FOR THE CONQUEST AND THE CLEARING OF THE GHOTO. By Lieutenant-Colonel Bru and Major Cortot.

THE CORPS OF THE ADMINISTRATION OFFICERS FOR THE STAFF AND RECRUITING. By Sanguinede, Administration Officer of the Staff.

Revue Militaire Française, October, 1928

THE BATTLE OF THE AVRE (Completed). By Major d' Argentieu.

CROSSING RIVERS IN THE PRESENCE OF THE ENEMY. By Colonel Baills.

GENERAL BRIALMONT. By Lieutenant-Colonel Mayer.

THE ORIGIN OF THE NEW REGULATIONS OF THE MEDICAL DEPARTMENT. By Surgeon General Uzac.

THE OPERATIONS ON THE BORI-GANOUS, SEPTEMBER 25, 1925. By Colonel Goudot.

Bulletin Belge des Sciences Militaires, October, 1928

THE OPERATIONS OF THE BELGIAN ARMY—THE ORGANIZATION OF THE ARMY DURING THE WAR.

A CATALOGUE OF THE FIELD ARMIES AND THE BELGIAN FORTRESSES IN 1914. By Lieutenant-Colonel B. E. M. Duvivier and Major B. E. M. Herbiet.

THE TANKS. By Major Lievin.

HISTORY OF THE ENGINEERS. By Lieutenant-Colonel Coppens.

THE MEETING ENGAGEMENT BETWEEN THE 3RD FRENCH COLONIAL DIVISION AND THE VI GERMAN C. A. NEAR ROSSIGNOL, SAINT-VINCENT, AND TINTIGNY AUGUST 22, 1914.

THE ORGANIZATION OF THE NATIONAL DEFENSE IN SWITZERLAND. By L'Armeé.

Bulletin Belge des Sciences Militaires, November, 1928

THE OPERATIONS OF THE BELGIAN ARMY—THE ORGANIZATION OF THE ARMY DURING THE WAR.

HISTORY OF THE ENGINEERS. By Lieutenant-Colonel Coppens.

A SCHEME FOR THE INDOOR STUDY OF PROBLEMS OF MACHINE-GUN FIRING. By Captain Ordies.

THE PREPARATION OF THE TELEPHONE-SIGNAL OPERATORS OF THE REGIMENT. By Lieutenant Yernaux.

THE TWO BATTLES OF THE MARNE.

THE ORGANIZATION OF THE NATIONAL DEFENSE IN SWITZERLAND.

***I might tell you that I don't believe I ever stood up straight in my life until I took military training. I might tell you that it was as a cadet on long hikes that I first sensed great responsibility for the care of others under me. I might indicate that it was military training and athletic training which first developed my sense of the importance of human coordination and cooperation, of getting big things done by team play or mass work when they couldn't be gotten by individual actions. These are only a few of the great character lessons which may be garnered from the Military Department. I speak to you about them somewhat passionately because I know from personal experience what two years of elementary military training and two years beyond that can do for you.*—Henry Suzallo, President of Washington University.**

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. W. E. Cole, *Colonel, Coast Artillery Corps, President, Coast Artillery Board.*

Project No. 666, Test of SCR 131 Radio Transmitter and Receiver.—The requirements of this set are that it should have a frequency range of 3960 to 4360 kilocycles and that it should be capable of operating up to a distance of five miles. It is intended as a replacement for the SCR-77-B in the Infantry regimental net and for the SCR-79-A in the Infantry brigade net. A test of the set is in progress with a view of determining its suitability for use in antiaircraft regiments.

Project No. 667, Motor Transportation in Antiaircraft Artillery.—This is a study of the transportation requirements of antiaircraft artillery regiments.

Project No. 668, Test of Wavemeter, Type 174-D.—This wavemeter is a commercial product designed to replace the SCR 125-A wavemeter which is now approved as a standard for issue but not for procurement. It is believed that the new apparatus should have considerable advantage over the SCR-125-A both in accuracy and stability of calibration. Test of the Wavemeter Type 174-D is under way.

Project No. 669, Comparative Test of Field Glasses.—Several types of field glasses, foreign and domestic, are being tested to determine their suitability for the service.

Project No. 670, Switchboard, Type BD-10 (Telephone, monocord, 8-line).—The question of the advisability of replacing the Switchboard Type BD-10, by two Switchboards, Type BD-9 (4-line monocord) or by one Switchboard, Type BD-11 (12-line monocord) was presented. The Board recommended that Type BD-10 be declared obsolete and that Type BD-9 be substituted for issue to antiaircraft searchlight batteries.

Project No. 671, Development of Motor Vehicles (one 3-ton six-wheel drive truck, single tires; one 3-tno two-wheel drive truck).—At the request of the Quartermaster Corps the Coast Artillery Board recommended that experimental vehicles to be purchased include the following features:

Body similar to the Class "B" cargo body.
Balloon tires—dual tires on rear of 3-ton two-wheel drive truck.
Towing pintle on rear of each truck; pintle or towing hooks on front of trucks.
Other features, such as size of tires, ground clearance, and mechanical details to follow commercial practice.

Project No. 672, Insulator, Type In-53 (Wooden knob).—Recommendation was requested as to whether or not the insulator, type IN-53 should be carried as "A" equipment to be used in the field, consideration being given to the needs of the Signal Corps and to other branches installing field telephone systems. It was recommended that the Insulator, Type IN-53 be carried as "A" equipment for all signal communication troops installing field telephone systems, and that so much of the Tables of Basic Allowances as pertains to "Insulators, wooden knob," remain unchanged.

Project No. 673, Issue of Car Jacks to Railway Artillery.—This is a study of the necessity for issue of journal jacks for each firing battery of railway artillery.

Project No. 674, Mounting of 75-mm. Subcaliber Mount T-3, on 16-inch B. C. Model 1919MI.—Drawings were submitted to the Board showing two mountings. In one of these the subcaliber mounting is to the rear of the 16-inch trunnions, and in the other the trunnions of the 75-mm. cradle and 16-inch cradle lie in the same vertical plane at zero elevation. The latter scheme is preferred, and recommendation has been made that a pilot model be constructed and subjected to service test.

Project No. 675, Spotting and Adjustment Board, 1928.—This instrument is designed to combine the best features of several spotting boards previously submitted for test, with a means for adjusting fire in both range and direction. A model is under construction.

Project No. 676, Elevating Mechanism, 12-inch Railway Mortars.—This is a study of possible improvements in present mechanism to permit more rapid elevation and depression. A 2-to-1 gear ratio superimposed upon the present elevating gear has been tried by the 41st Coast Artillery and 52d Coast Artillery. It was recommended that funds be allotted for purchase of four (4) pairs of steel cut gears to be applied to four mortars at Fort Eustis.

Project No. 677, Ammunition Service, 12-inch Railway Mortars (Overhead Suspension System).—An improved model of the overhead system for handling ammunition designed by Captain H. W. Ostrander, C. A. C., and successfully used in target practices at Fort Eustis, is now being installed on certain mortars at Fort Eustis for further test.

A few prominent citizens are making severe accusations against our new system of defense which betray an ignorance of the facts of our development. Typical of such statements is one to the effect that "the militarists of the nation are carrying on a far-flung campaign to Prussianize the nation. Our reorganization act seeks the same end that the German militarism sought—to make every male citizen of military age a unit of the war machine." I have no sympathy for such views, for the reason that they convey an insult to American manhood. There is an ingrained abhorrence of militarism in the minds of Americans, and it is absurd to assume that this can easily be removed. Those who cry out that contact of civilians with army officers will militarize the former should stop to think of what they imply. Even though our officers were seeking militarism—which they most decidedly are not—is our plane of intelligence so low that these few, a mere handful in the midst of the civilian population, can convert the millions to an abhorrent doctrine?—Secretary of War John W. Weeks.

BOOK REVIEWS

Principles of War Throughout the Ages (Des Principes de la Guerre à travers les Ages). By Major R. Van Overstraeten, Instructor in Military History at the Belgian War College. Brussels: Librairie Albert Dewitt. 1927. 6½"x 10". 2 v. with 150 separate maps. Ill. f 150.

This extremely interesting book is written in two volumes, the first beginning with Alexander the Great and coming down through the Russo-Japanese War and the second covering the World War. The 150 plates are adequate, but might be more useful if referred to in the text by number.

One of the reproaches that can be made to many French military historians is that they base their work on French and German sources alone, not being able to translate English and, in many cases, not considering that English or American sources would contribute anything of additional value. In this case, however, the bibliography includes many English and American sources, including the Official Report of General Pershing, the memoirs of Admiral Sims, and the writings of Admiral Mahan, the latter being referred to by the author as a "penseur d'élite."

No mention is made of the Civil War; as might be expected more than the usual space is given to the operations of the Belgian forces in the World War, including a spirited defense of the action of the King of the Belgians in concentrating the entire Belgian Army at Antwerp instead of attempting to reinforce the left of the Allied line, during the early days of the War.

Each section of the book, covering a war, a campaign, or a phase of a campaign, is divided into three parts; the first part gives the general situation with notes on organization and tactics, the second part gives a description of the events, and the third contains a number of observations by the author in the nature of criticism and lessons to be drawn. Of special interest to an American officer is the brief, but concise, analysis of the French tactical doctrines in vogue in 1914, which were faulty to the extreme and not based on any of the lessons that should have been learned from the Russo-Japanese War—particularly the effect of fire power, both artillery and automatic weapons.

It may be objected that too many of the observations bear on strategy rather than tactics; for example, in the period prior to and including the Battle of the Marne the observations cover principally the faulty distribution of both French and German forces and the lack of coordinated control of all the German Armies and fail to cover tactical lessons of great importance, such as the complete failure of the French Cavalry to fulfill its combat missions, due both to training and to tactical principles in vogue in 1914; it was not trained or equipped to fight dismounted and was not provided with sufficient fire power. This fact is admitted without reservation in the cavalry doctrine now being taught at the French Ecole Superieure de Guerre.

There is no index, only an outline at the beginning of the first volume; the French itself is not specially difficult although the military and technical term may require the use of a good French-English military dictionary covering all the military terms and expressions evolved during the World War.—J. H. C.

Without Censor. By Thomas M. Johnson. Indianapolis: The Bobbs-Merrill Company. 1928. 6"x 9¼". 411 pp. Ill. $5.00.

It is unfortunate for the reading public that propaganda and censorship are two of the necessary evils of war, but there is such a thing as public morale and where the truth will

not serve to build up or maintain morale the truth can not be given out. To be successful abroad the army must be supported at home and now that war has become a matter involving the whole nation it is more important than ever that the army in the field be not subjected to the notorious fickleness of popular fancy. Every student of history is familiar with the wave of despair or of gloom which is likely to sweep over the country after some inconsequential reverse, as that at Big Bethel in Virginia during the Civil War.

During the World War practically every bit of news that reached this country from the A. E. F. passed through the hands fo a censor. Soldiers submitted their letters unsealed before mailing, and all news stories were edited before being put on the wires. Even the official communiqués did not always tell the whole truth. Small successes were magnified and reverses were belittled or were not mentioned. There is therefore much that needs correction and there are many unpublished stories of what really happened in France.

From the summer of 1917 until after the Armistice, Mr. Johnson was the accredited representative of the New York *Sun* and followed the Army in all its actions. As with the other correspondents, he forwarded only such accounts as received the approval of the censor system, but he saw and heard of many things that were never published.

Now that the war is well behind us and further concealment of the truth could serve no good purpose, he gives us many uncensored stories of the A. E. F. In their preparation he has made use of his own material, but he has had access to many official records and has had the assistance of many officers, as Generals Drum, Fox, Connor, Sumerall, Kernan, Bullard, McGlachlin, Dickman, Menoher, Craig, Von Gallwitz, and others. His acknowledgements require five pages, so we may accept the accuracy of his narrative.

Some of the things he now brings to light are why the Americans did not exploit their success at St. Mihiel, the battles which we did not fight in Alsace and Lorraine, the conferences between Foch and Pershing in preparation for the last big drive, the results of the first day's fighting in the Meuse-Argonne, the matter of supplies and auxiliary services, the lost battalion, and the race for Sedan which caused such a row.

The account has been painstakingly prepared and is most interesting throughout. The book is profusely illustrated with familiar scenes which will recall to the reader many memories—pleasant and unpleasant—traffic jams, O. P.'s, Montfaucon, road dumps, rolling kitchens, trenches, and so on. In many respects it is the most important book of the A. E. F. which has appeared in several years.

James Wolfe: Man and Soldier. By W. T. Waugh, Kingston Professor of History, McGill University. Montreal: Louis Carrier and Co. 1928. 6¼"x 9¼". 333 pp. Ill. $5.00..

General Wolfe began his career at the age of fifteen, as an ensign in Flanders, and ended it at the age of thirty-two as Commander-in-Chief before Quebec.

Throughout that short career one predominant characteristic stands out—utter absorbtion in his profession. Also, he had luck. Luck and zeal alone would account for his rise in seventeen years from ensign to general. For, while he was handicapped by poverty and comparative social obscurity—considerable obstacles in the Eighteenth Century—competition was anything but keen. The average commissioned officer of those days was a pretty poor lot.

But Wolfe had more than zeal and luck. He had a sound mind (though far from a sound body), high courage, and a strong will. Also, he had quick decision. At Louisbourg he commanded the principal landing attack. Just before his boats reached the shore the French opened so heavy a fire that Wolfe saw a landing was impossible. He ordered a retreat. (Imagine being able to do such a thing in these days!) While he was pulling out he noticed that a few boats, which had gone astray on a flank, had blundered onto an undefended beach. Instantly he ordered a dash for that new landing place—and so pulled success out of failure. Here, of course, was luck; but also something more. As Professor Waugh so well puts it; "Every famous general in history has been amazingly lucky, be-

cause only a general capable of turning his luck to account can ever hope to become famous."

Wolfe's fame as a general rests only on the sieges of Louisbourg and Quebec, in the last two years of his life. At Louisbourg, Amherst commanded; and Wolfe's work, though highly creditable, was not solely responsible for the success of the British expedition. At Quebec, as Waugh frankly says, Wolfe never appeared to less advantage than during the first two months of that short siege. He was an ill man. He thought his career was ruined, and Waugh thinks he was even then dying of tuberculosis of the liver. But just as the siege was about to be raised at the approach of autumn, Wolfe undertook that "desperate plan," as he himself called it, by which he retrieved a campaign which was palpably failing—and won undying fame.

It was an extraordinary career. Seventeen years of nothing more than sound military ability; one short day of success so amazing as to rank him high among all military leaders, even had death on the battlefield not added a halo to his laurels.

For the landing at the Foulon and the scaling of the Heights of Abraham was much more than a "desperate plan." After a century and a half it still ranks as a masterpiece. Every factor of the military art is there. Secrecy, surprise, and simplicity stand out in perfection. All the preliminary movements by which his able antagonist (and his own blundering subordinates) were misled, all the details of cooperation with the Fleet, all the tactical arrangements were admirable. "Every joint of the machine clicked into its place," writes Professor Waugh, "and the whole ran smoothly and under perfect control from beginning to end. In those last hours of his life, Wolfe proved himself a master of his craft."

Three years ago a British officer, Lt. Col. L. H. Thornton, Director of Military Studies at the University of Cambridge, published a series of short military biographies called *Campaigners Grave and Gay.* In his essay on Wolfe, Colonel Thornton, following the lead of another British officer, General Mahon, discussed and apparently accepted the theory that Wolfe's landing at the Foulon was by pre-arrangement with some French traitors in high office at Quebec.

Professor Waugh does not mention this interesting theory, but his description of the corruption then prevailing among the French officials in Canada (Montcalm always excepted) makes it clear that such an act of treason might well have taken place. Even if this theory be accepted, however (and it rests only on circumstantial evidence), it would not greatly detract from Wolfe's fame. The perfection of his plan remains, and also its boldness. For how could Wolfe have known that the apparent French treason was not a trap.

Whether or not there was French treason, the only valid criticism of Wolfe's last operation is that he himself thought it a "desperate plan" in the success of which he seems to have had little confidence. Which may explain, while it also adds renoun to his insistance on leading his troops in person and being the first man ashore at the Foulon.

An admirable biography.—S. M.

The United States Navy. By Rear Admiral Thomas P. Magruder. Philadelphia: Dorrance and Company. 1928. 5¼"x 8". 179 pp. Ill. $2.50.

In writing for publication during the past year, Admiral Magruder made some statements and expressed some views which drew down upon his head Departmental ire. Not that he was ever publicly told so, but shortly after the publication of the views in question he was relieved of his command at the Philadelphia Navy Yard and placed on a status of "waiting orders" as an "administrative . . . measure."

From education at the Naval Academy and the Naval War College, from service through all grades from Midshipman to Rear Admiral, and from experience in two wars, Admiral Magruder is well fitted to make constructive criticism of the operation and administration of the Navy. This is the purpose of his book, which is a revision of his published articles. That some of his criticisms may be construed as destructive rather than constructive does not in any measure detract from the value of the book nor from the sincerity of the author's

desire to see our Navy second to none in power, equipment, and efficiency. Separate chapters are devoted to battle ships and battle cruisers, light cruisers, destroyers, submarines, and aircraft carriers. He argues that all these are necessary, that each has an important part to fill in naval warfare, but that the battleship is and must continue to be the deciding factor in battle. One may perhaps dispute some of his statistics and the aeronaut may even be willing to argue against his stand on surface vessels, but one can scarcely deny his general conclusions.

> Since the War of 1812, . . . it has been the policy of the United States Navy to arm its ships with the heaviest possible batteries. Let that policy continue and America will have peace and . . . be in a position to engender a spirit of good will throughout the world.
>
> The first line of defense is not the Navy. It is diplomacy . . .
>
> In the wars of the past the destroyer has played an important and spectacular part. In the next war, . . . the destroyer may have even a greater influence in the final decision of a war.
>
> The submarine has its functions in war ,and these are most important. At times, even, they may be indespensable. . . . In the center of these controversies always there is a rallying point, and that, in naval warfare, is and will continue to be the first battleship.
>
> The United States should spare neither time nor money to make its merchant marine at least the equal of that of any other nation. . . . the greatest of all pestilences—War!

The War In the Air, Vol. II. By H. A. Jones. New York: Oxford University Press. 1928. 5½"x 8¾". 508 pp. Maps. $7.50.

The War In the Air is the story of the part played in the World War by the Royal Air Force. Volume I was written by Sir Walter Raleigh, whose ideas are carried out by Mr. Jones, insofar as possible, in Volume II. written subsequent to Sir Walter Raleigh's death. It is to be presumed that other volumes are to follow from the pen of Mr. Jones. for in Volume II we do not find the end of the chronological account of the activities of the Royal Air Force.

The scope of the present volume includes, for the land operations, the Dardanelles Campaign and the Western Front from the winter of 1914-15 to the end of the Battles of the Somme in November, 1916. It includes the naval air operations in Home Waters to the end of 1916, and also, up to the same time, the activities of the naval air units from Dunkirk and Luxeuil.

In substance, the book contains some account of materiel development, somewhat fuller details of tactical developments, but in the main confines itself to the operations phase. The history is essentially one of the activities of the various units of the Royal Air Force. For each battle or phase, the assistance rendered by the components of the air arm is given in detail as to number and type of missions attempted, number and degree of successful missions, and the units concerned therein. As an authentic text for students of the past development of the air arm, or those interested in the activities of specific British air units, this book will be invaluable. The average reader will have one complaint. Mr. Jones is writing of what is considered to be the most thrilling development in the art of war. He narrates incidents of extraordinary heroism—but he does it in the calm manner of a man laying brick. One cannot but hope that perhaps on the next page Mr. Jones will use a superlative.

It is interesting to note in some detail the official attitude of the British army at the time toward antiaircraft. In this regard Mr. Jones states:

> This was not a Royal Flying Corps responsibility, but it was so intimately bound up with the employment of aeroplanes that the air stoiy will not be intelligible without some account of the organization which grew up to the help of the air service. The antiaircraft shell may be likened to a fighting aeroplane which reaches its opponent

> in seconds rather than minutes. It has not, of course, the same certainty, but its moral effect was great. It tended to keep enemy pilots high up, harassed them in their work, had a heartening effect on the men on the ground to whom it gave visible protection, and, incidentally, signalled the whereabouts of hostile aircraft to friendly pilots who might be near. But most of all, from the Flying Corps point of view, was the fact that good ground defenses reduced the demands made on the aeroplanes for protection and so released them for their more urgent primary duties. . . . On the other hand, British aeroplanes at that time suffered far more from gunfire than from enemy aircraft.

The War In the Air is a complete picture, well painted, but it is a vivid subject and should be painted in more vivid colors.—B. F. H.

Practical Flying. By Major Byron Q. Jones, Air Corps, U. S. Army. New York: The Ronald Press Company. 1928. 5¾"x 8¾". 210 pp. Ill. $3.00.

Realizing that there is a growing demand for practical information on "how to fly" the author, who was one of the pioneer's of aviation, has endeavored to place his vast experience as an aviator at the disposal of the many ambitious students by compiling a training manual for airplane pilots. The author's claims that he has never been of the school that restricts flying as a mysterious art for *the chosen few* probably disqualifies his book with *the chosen few;* however, it should be, and probably is, accepted as an authoritive text by many aviation schools and instructors.

The first nine chapters are devoted to a discussion of the personal attributes desirable of a pilot. When the reader or student has completed these chapters he can pass on to the succeeding chapters with a confident feeling that he is or is not qualified to fly. The technical features of the airplane are very interestingly described in Chapter X, while Chapter XI acquaints the reader with flying parlance.

Beginning with Chapter XII the author makes each chapter a complete lesson in practical instruction to the student pilot. These lessons are put in the stimulating form of simple questions and answers that would naturally be asked by a keen student desiring to become a pilot. The lessons are arranged in progressive order from "the first flight" through the essential steps of ground instruction and air instruction to the "solo flight," including in all twenty lessons. Each of these lessons is short and simple, and is demonstrative as well as informative. The last five chapters touch upon the advanced courses of flying instruction.

It is this reviewer's belief that all amateur aviators could profitably procure a copy of this book in which can be learned a working knowledge of practical aviation which will assist them materially in any future study of the "art of flying."—J. L. W.

The Story of a North Sea Air Station. By C. F. Snowden Gamble. New York: Oxford University Press. 1928. 6¼"x 9¼". 429 pp. Ill. $7.50.

Here is history in its most readable form. We are indebted to Mr. Gamble not only for the collation of the interesting material of the book, but also for the delightful manner in which he presents it. Histories usually comprise the narration of a series of happenings without comment and without the human element. In this particular history we are given the series of happenings and, in addition, the very human thoughts and actions of the men who made the history. Heroism, tragedy, humorous incidents, and the actions of human beings are the spices spread over the facts to make a most delectable dish.

The title does not express the scope of the book. 'Tis true, it is a history of the Great Yarmouth air station, but in the development of that history there is included, in more or less detail, the entire development of naval aviation up to the close of the war, both British and German. For example, in narrating the story of a Zeppelin raid on England, Mr. Gamble

gives in detail the activities at Great Yarmouth incident thereto and, in addition, follows each Zeppelin back to Germany, regardless of its course over England, whether close to Great Yarmouth or not. One of the most interesting features of the book is the parallel historical account of the developments at Great Yarmouth and at the German seaplane and Zeppelin stations that opposed Great Yarmouth. He is aided in this by official German documents and by living members of Zeppelin's crews and seaplane stations.

We recommend *The Story of a North Sea Air Station* as a book that is of interest historically and one that is enjoyed from the first to the last word.—B. F. H.

Meet General Grant. By W. E. Woodward. New York: Horace Liveright. 1928. 6½"x 9½". 512 pp. Ill. $5.00.

General Ulysses S. Grant was an unremarkable man who had a remarkable career. His youth and his early manhood gave no indication that success in any line would ever come to him. His solitary boyhood, his early struggle, his indolence at West Point, his drinking, and his failures in civil life are too generally known to call for comment except in so far as they offer a contrast to his career during the Civil War and afterwards. That success and fame should have been attained after such a record is not necessarily to be considered remarkable, but that success should have come to Grant in the military profession under the circumstances is so exceptional as to justify an intensive study of his entire career. Not a military student, Grant became famous as a general. Hating war, he made an enduring place for himself in history through his ability as a fighter.

Mr. Woodward, in his study of General Grant has come close to what is probably a true picture of Grant the man and Grant the soldier, stripping away the legends and myths while recognizing the greatness. Yet, in his effort to lay bare Grant's shortcomings the author displays some of the iconoclastic tendencies which is characteristic of much of the modern biography. This is, no doubt, a reaction from the saccharine hero-worship of earlier biographers but it is being overdone in present-day writing. In an endeavor to picture the man and to distinguish between him and his reputation, his weaknesses and his foibles are over-emphasized at the expense of his accomplishments and his outstanding good qualities.

Still Mr. Woodward's book is interesting, comprehensive, and provocative of thought. In it General Grant stands out in bold relief, against an unusually vivid historical background. Incidentally, there is also a splendid portrayal of the people of the North and the South at war.

It is interesting to note that the author ascribes Grant's success to three primary factors—early training, superstition, and luck—although these are neither emphasized nor associated. During the Mexican War, Grant received invaluable training in logistics through his service as regimental quartermaster; the siege of Vicksburg, which made Grant, was mainly a problem in logistics. The superstition, which Mr. Woodward calls an obsession, took the form of an intense dislike of turning back or retracing his steps, this was probably what kept him going on to a solution of the problem at Vicksburg, saved him at Corinth, and carried him to victory on more than one occasion. Luck, which cannot be wholly eliminated from human affairs, may or may not follow the law of accidental errors, but it certainly compensated Grant in his later years for the low average of his earlier years. The goddess of chance joined him about the time he received his commission as colonel and remained with him to almost the very end.

All this is perhaps but another way of saying that General Grant seized his opportunity when it came and that he had the ability to carry himself successfully through the events that followed. Undoubtedly he deserves his reputation as a great general, and Mr. Woodward, while making him intensely human, shows him to be great. More than this, the author understands the general—a gift not possessed by all biographers. Of necessity, he

has brought into the picture other outstanding leaders of the period; and these have not in all cases been subjected to the same careful study and analysis and the author's comments and criticisms are not always based on facts as found by recognized military authorities.

For example, on page 102, Longstreet "was to become the best fighting general in the Confederate army and Lee's right-hand man." It is true that Longstreet was strong and able in certain tactical situations. Generally he demanded that his enemy be forced to fight at a disadvantage, but he failed Lee on three notable occasions and Lee never undertook to carry out such combinations using Longstreet as he did with Jackson. Longstreet was not in a class with Jackson.

Again, on page 202, the "war came to an end because Sherman had broken the Confederacy in two in his march through Georgia and the Carolinas" and because Grant had "opened up the Mississippi." Sherman failed in the primary mission in the Atlanta campaign—the destruction of Johnston's army. His march to the sea had no decisive influence towards the defeat of Lee's army. It was spectacular, but it sowed bitterness and hate and made reconstruction more difficult. On page 181 we find: "Next to Grant, he [Sherman] accomplished more than any other general in conquering the Confederacy." Sherman was one of Grant's ablest lieutenants when a corps commander and directly under Grant. Alone and independent he preferred to maneuver the enemy out of position rather than destroy him by hard fighting. With Lee as an antagonist Sherman would never have ended the contest as Grant did.

On page 253, the death of General Johnston is regarded as having changed the possibilities of success for the Confederate attack. When one remembers that Johnston had not organized a well-coordinated attack and was not personally directing and controlling his entire front, that when he was killed he was personally leading a brigade unit in a melee, it would seem that his influence on the final results would have been too limited to have changed the outcome.

Six Months With the Sixth Brigade. By Colonel Charles Crawford, U. S. A., Retired. E. B. Barnett. 1928. 5¼"x 7¾". 220 pp. $1.50.

This book will be a great disappointment to Colonel Crawford's friends and even to his relatives and descendants. It would have been better had he compiled this for his own family's archives, and even then a great deal should have been written more gently or entirely omitted.

It has no particular military value. Colonel Crawford hits every head in sight, often in fashion unworthy of him, and instead of the book containing valuable suggestions, critiques, and information such as might be expected of one with his training and ability and as he doubtless could submit, it is merely an argument that everybody was wrong, from the Secretary of War down, because he was relieved from command of a hard-fighting brigade while under fire. It is tragic that such a once capable officer, after long service, should for his own ends help the alibi seekers.—J. V. P.

Spies. By Joseph Gollomb. New York: The Macmillan Company. 1928. 5½"x 7¾". 389 pp. $2.50.

Probably no activity connected with warfare is held in greater disrepute than spying, yet spies have been used from the earliest ages. The penalty in time of war is death if the spy is caught in the act of espionage, but the penalty has never prevented the hiring of spies. The spice of danger is so attractive to certain types of character that in time of need there can always be found someone who is willing to match his wits with those of the enemy—and pay the penalty if he fails.

The difficulty of writing about spies is that they always work in the dark and even when they are apprehended much of their activity remains shrouded in mystery. Seldom does

the spy care to be known as such and it is unusual for him to talk about his operations, however successful they may have been. Occasionally some of the work of spies comes to light, and it is from such sources that the author has drawn his material and initiated his investigations.

Going back into Biblical days, Mr. Gollomb has collected the stories of the most brilliant spies of all ages. Some of the stories are already well known, as Moses' emissaries to the land of Canaan, Benedict Arnold, Nathan Hale, and Belle Boyd. The majority of the spies, however, are comparatively unknown.

Most interesting, perhaps, are the stories of World War espionage, and nearly half of the book is devoted to them. "England sets a Spy Trap" and catches Hans Lody and "A Netful of Spies." Louise de Bettignies was "The Spy Who Found High Adventure" in Belgium, and Mata Hari was "The Spy Who Danced Her Way to Death" for the Germans. The last chapter includes the stories of a number of "Spies Who Won."

The whole book is a collection of thrilling tales which offer many a dramatic situation made to order for use in imaginative writing.

Voltaire—Genius of Mockery. By Victor Thaddeus. New York: Brentano's. 1928. 6¼"x 9¼". 291 pp. Ill. $5.00.

The life of a fighter—a fighter hampered by almost every material and physical disability. But what a mind and what a spirit! "For more than eighty years the indomitable will-to-live which inhabits this frail human organism will hold it intact through sickness upon sickness, defending from the corruption of the grave the integrity of a glorious mind."

And with that brilliant intellect, perhaps the most fertile brain the world has known, went gaiety, wit, and a human touch to vitalize his genius. "Old in years, in gaiety, zest for living, above all hope, Voltaire has remained always young. For all his mockery and scepticism he dies convinced that the dark reign of superstition is nearing its end. 'You will see great days—you will *make* them'."

The story, in itself full of interest and inspiration, is very well told in this book. Frederick the Great, Voltaire's intermittent friend, comes in for a bit of character drawing which is excellent.—S. M.

The Confederate Privateers. By William Morrison Robinson, Jr. New Haven: Yale University Press. 1928. 6"x 9¼". 372 pp. Ill. $4.00.

The only value this book has is that it contains the record (largely derived from contemporaneous newspaper sources) of the comparatively unimportant operations, mostly confined to the first year of the war, of the Confederate privateers. These small ships raided coast-wise shipping, generally at no great distance from the Southern ports. Their operations had no effect on the war and were far less important than those of the blockage runners or the cruisers. The most interesting chapters of the book are those on the ram *Manassas* (privately built but operated by the Confederate Navy) and the early attempts at submarines.—S. M.

Sails and Swords. By Arthur Strawn. New York: Brentano's. 1928. 5½"x 8". 341 pp. Ill. $3.50.

A biography of Balboa. It claims to be the only one in the English language. At any rate it is a very readable one. It paints Balboa in glowing colors. It makes of his life a succession of amazing ups and downs, culminating in the final climax of his betrayal and execution at the hands of his enemy, the Spanish Governor.

The treachery and wholesale cruelty of most of the Spanish *conquistadores* are fully brought out in this book—largely throwing in relief the virtues of Balboa. It is curious

that they should have found dogs effective in fighting the Indians, as well as in torturing them.

The hardships endured by the early Spaniards on the Isthmus are almost past belief. And to the terrors of the climate to men in armor, to their complete ignorance of all sanitation, was added an appalling corruption in all forms of administration. No wonder they died like flies. The marvel is that they accomplished so much. "Spain: she makes men—and wastes them."

But if we may believe Mr. Strawn, Balboa was an outstanding exception in his day and generation. As a soldier, explorer, pioneer, and colonial administrator he appears in an admirable light. The description of his crossing of the Isthmus and discovery of the Pacific is most interesting.

He was a simple soldier-man, having little use for lawyers and such. "Most Puissant Lord," he wrote the King, "I desire to ask a favor of Your Highness, for I have done much in your service. It is that Your Highness will command that no Bachelor of Laws nor of anything else, unless it be of medicine, shall come to this part of the Indies on pain of heavy punishment which Your Highness shall order to be inflicted, for no Bachelor has ever come here who is not a devil, and who does not lead the life of devils. And not only are they themselves evil, but they give rise to a thousand lawsuits and quarrels. This order will be greatly to the advantage of Your Highness' service, for the country is new."

An interesting book.—S. M.

Desert Drums. By Leo Crane. Boston: Little, Brown & Company. 1928. 6"x 8¾". 393 pp. Ill. $5.00.

A volume of essays on the Pueblo Indians of New Mexico, pleasantly written, and illustrated with many excellent photographs. The author assumes the reader to have a general knowledge of the history of New Mexico and of the political aspects of Indian affairs; he does little to correct any existing deficiencies in these respects, but indulges in a running fire of comment on certain of the more interesting incidents. The book is in no way a reference text, and is informative only to a limited degree. However, many of the anecdotes recounted present graphic side-lights on a people of unknown antiquity, who were conquered by the Spanish long before Jamestown was first settled, who were ruled successively by Spaniards, Mexicans, and Americans, and who today bear less resemblance to the plains Indians than to the Igorote peoples of the Philippines.—F. M. G.

Elizabeth and Essex. By Lytton Strachey. New York: Harcourt, Brace and Company. 1928. 296 pp. Ill. $3.75.

This book needs no review. It will be read as a matter of course by all to whom biography and history appeal. And they will in no way be disappointed, for Strachey is still the unexcelled master of biographical portraiture done in superb prose. Here he has drawn a half-dozen of unforgettable characters, Philip of Spain, Burghley, Bacon, Raleigh, Cecil, and Essex. Best of all is the greatest of the Elizabethians, Elizabeth herself, that amazing enigma, compact of contraditions, who, with all her faults, gained both success and adoration—"Gloriana."

The book covers only the last sixteen years of the forty-five of Elizabeth's reign. It is to be hoped that Lytton Strachey will some day complete his story of the Queen whose character, far more complex than the head-strong Essex, gives full scope to his genius.—S. M.

Leonardo the Florentine. By Rachel Annand Taylor. New York: Harper and Brothers. 1927. 580 pp. Ill. $6.00.

Life and Times of Pieter Stuyvesant. By Hendrik Willem Van Loon. New York: Henry Holt and Company. 1928. 336 pp. Ill. $4.00.

The contrast between these two recent biographies is both sharp and interesting. Had Mrs. Taylor not been able to write so well, she would have written a better book. Her word pictures carry her away; her unusual facility in English prose overpowers the reader. It would not be polite to suggest that a lady might become intoxicated on words. But in this case it seems a pity that so interesting a subject in the hands of so erudite an authoress could not have been graced by a little more simplicity.

Mr. Van Loon's style is the exact opposite—journalistic, snappy, modern, eminently readable.

Both books deal with time and circumstances rather than with their heroes. But what a contrast! The beauty and the brilliance of the Renaissance in the one; the rather sordid squalor of New Amsterdam and the petty commercialism of Holland in the other. Only in his chapters on the explorations for a Northeast Passage does Van Loon come into the scope of real adventure or romance. And where could one find greater contrast than between the almost superhuman Da Vinci and the all-too-human Stuyvesant?

But both of these books are excellent in their different ways. One deals with a relatively simple subject in a direct and simple style—and with the affection of a compatriot. The other paints the gorgeous canvas of the Renaissance in all of its own sumptuousness.—S. M.

St. Nicholas Book of Science. By Floyd L. Darrow. New York: The Century Company. 5"x 7½". 324 pp. Ill. $2.50.

The author is science editor of *St. Nicholas* and has taught science, written several books on various phases of science, and is generally familiar with developments in scientific fields. In this book he has prepared what may well be called a yearbook of science, for he covers all fields in a chronological rather than a classified order. No event has been too small to be recorded, and no field related to science has been overlooked.

Transatlantic telephone communication, television, astronomical discoveries, anthropological developments, the Mississippi flood, the isolation of illinium, use of ethylene gas in ripening fruit, aeronautical progress, protection against poison ivy, steel manufacture, bird migration, the talking movie, numerous scientific expeditions, the X-ray, Hertzian waves, cosmic rays, invisible light, some great engineering projects, radio photographs, and the new cathode ray tube are a few of the many subjects discussed. The language is clear, graphic, and entirely non-technical and can readily be understood by young boys with an inclination toward science. In general, each subject is treated historically and the objective, value, or use of the particular development is indicated. Although the book was written primarily for young people, adults will find it a valuable survey of recent scientific achievements. A carefully prepared index augments the value of the book and permits of its use as a reference work. A very useful book.

Warpath and Cattle Trail. By Hubert E. Collins. New York: William Morrow and Company. 1928. 6¼"x 9¼". 296 pp. Ill. $3.50.

In 1883, as a boy ten years of age, the author spent many months at his brother's ranch in Oklahoma. The ranch houses stood on the old Chisholm Trail from Texas to Abilene, Kansas, near its crossing over the Cimarron River, then known as the Red Fork of the Arkansas. Practically all of the cattle driven through the Indian country from Texas passed over the Chisholm Trail, and the author had opportunity to observe cowboys, Indians, bull whackers, mule skinners, sheep men, and a few desperados during a part of the most impressionable period of his life.

The story is a record of life and events as he saw it or heard of it at first hand. It contains much of interest, but it is, not unnaturally, a trifle disappointing. With a boy's

irrepressible curiosity, he sought the whys and wherefores of everything he saw, and it is of these things that the book deals. His field of observation was, unfortunately, the restricted field of youth and he gives us no particular background. Geographically, he can not get far from the ranch.

The Indians he meets and learns to know are, for the most part, Cheyennes and Arapahoes. Playing, as he did, with the Indian children of his own age, he saw the red men and red women as fathers and mothers and found them tolerant, kindly, and humorous. The reviewer never had intimate knowledge of life in the Indian Territory, but the similarity between the conditions and the people he knew in the Sioux country and those reported by the author leads him to commend the book, as does Hamlin Garland in the foreword, "to those who share the increasing interest in *Americana*."

Short Story Writing. By Mary Burchard Orvis. New York: The Ronald Press Company. 1928. 5"x 7½". 291 pp. $2.25.

After a number of years of experience in teaching story writing to university extension students in evening classes and in home study courses, the author, who is Assistant Professor of Journalism at Indiana University, has prepared this volume to give practical help to those who wish to write stories. There is, naturally, much of the orthodox in what she has to say. No book on the writing of short stories could omit a discussion of the importance of clarity, the nature of the short story, the source of plots, character depiction, atmosphere, setting, and all the other angles of imaginative writing, and these are all discussed in proper sequence and in well-balanced proportion. The new note—and one which is frequently overlooked or subordinated by teachers—is the importance of psychological and sociological study of humans as a source of character material. This is stressed—rightly, we believe. No writer can create a convincing character if he fails to understand the motivating influences which make humans the queer beings they are. The author suggests that the fiction writer should know at least the fundamentals of Freudianism. Behaviorism, as taught by Watson, might be of more practical benefit if one can believe that we are environmental products.

As examples of typical short stories, the author reproduces "The Killers," by Ernest Hemingway, "The Doll's House," by Katherine Mansfield, "Six Dollars," by Wilbur Daniel Steele, "Quality," by John Galsworthy. "The Father," by Björnstjerne Björnson, "The Birthmark," by Nathaniel Hawthorne, "The Cask of Amontillardo," by Edgar Allan Poe, "The Adoption," by Guy de Maupassant," and "Moonlight," by Guy de Maupassant.

Written clearly and simply and with a good index, this volume is one of the best on the subject of short story writing.

A West Pointer's Honor. By Major Alexander W. Chilton. New York: Harper and Brothers. 1928. 5"x 7¼". 267 pp. Ill. $1.75.

The author's service at West Point as a cadet and as an instructor has given him an insight into cadet character which make his stories seem real. In the present volume a cadet, true to the Academy code, sacrifices himself for a comrade, with an outcome far more favorable than he had any right to expect.

Cock Pit. By James Gould Cozzens. New York: William Morrow and Company. 1928. 5¼"x 7½". 302 pp. $2.50.

A dramatic story centered in the sugar industry of Cuba and the more-or-less open warfare of great corporations.

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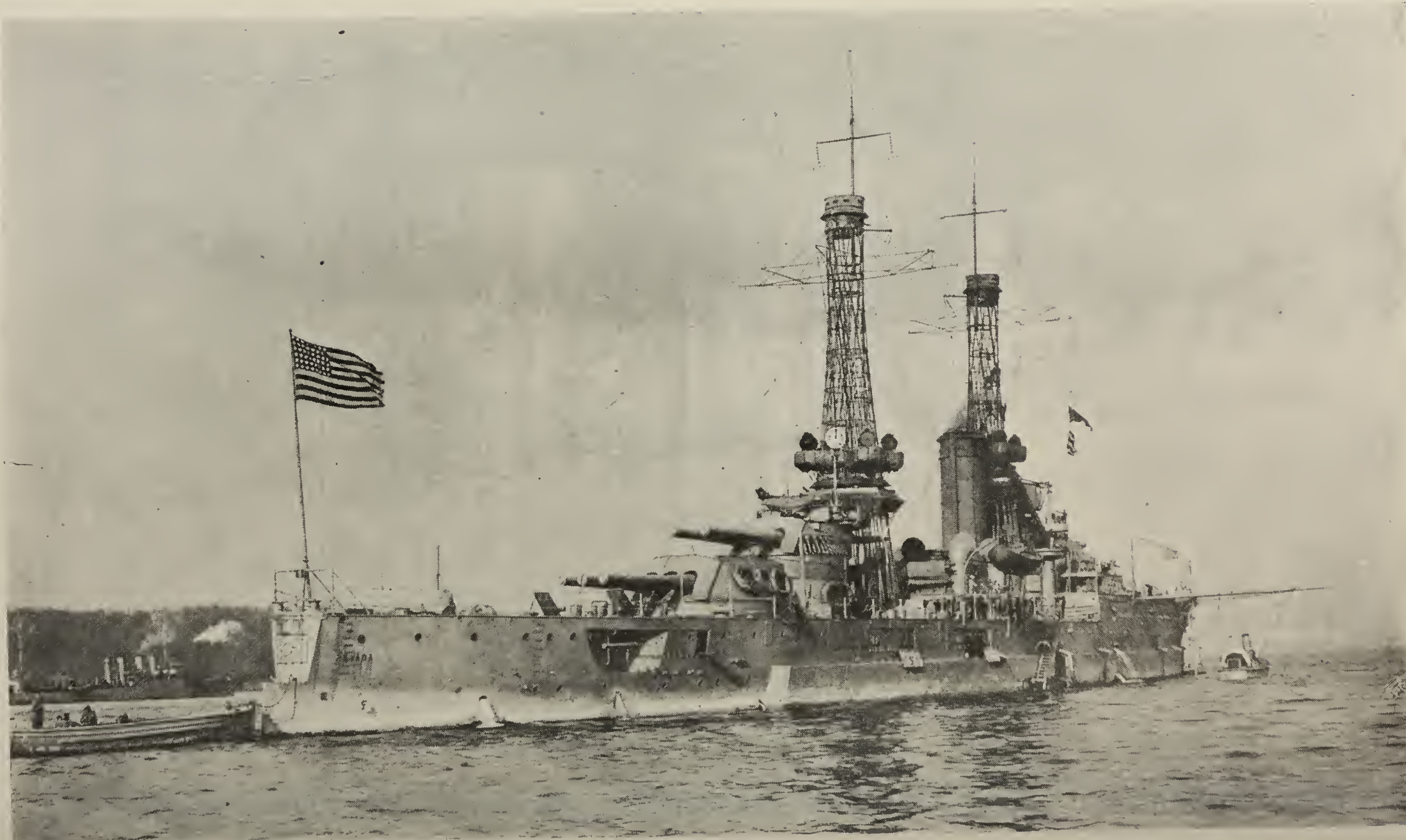

U. S. S. NEVADA

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Attributes of Efficiency

A Treatise On the Mobile Antiaircraft Gun Battery

By Captain Benjamin F. Harmon, C. A. C.

First Prize, Annual Essay Contest

IT has been stated, in definition, that "a good gun is a gun that is where you want it, at the time you want it, with sufficient ammunition, and ready to fire." Let us augment this definition somewhat, modify it a trifle, and say of the mobile antiaircraft gun battery:

> *An efficient battery is a battery that can be moved in time to the proper firing position, with sufficient ammunition, and can remain there and be prepared to deliver accurate fire on the proper targets.*

This maxim gives the thought underlying the discussion herein presented.

At the outset, let us select the word *accurate* from the latter part of the maxim, discuss the various ramifications into which it leads and then proceed to dissect and analyze the remainder.

The accuracy of fire of an antiaircraft battery is, paradoxically speaking, incapable of accurate definition, since the use of the word *accurate* implies a standard of comparison. Who shall prescribe the standard and who shall say to what limits of refinement our accuracy should proceed? The accuracy of fire is the result of innumerable small cogs running together to operate the entire machine, which is the battery. We may group them, broadly, under the divisions of (1) materiel, (2) gunnery, (3) training, and (4) opposition.

It is the materiel factor which has been given such tremenduous impetus by the Aberdeen exercises of the three years last past. The predicting interval (time of flight plus dead time) has been greatly decreased by attacking its two component parts. The continuous fuze setter, of recent development, has reduced the dead time from its war-time figure of 8 seconds to a more satisfactory one of about ½ second. It has disappeared, practically, from consideration. The time of flight has been reduced by increasing the muzzle velocity from about 1700 foot-seconds, as exemplified by the 75-mm. antiaircraft gun, to the values of 2600 and 2800 foot-seconds now in use—with at least 3000 foot-seconds in the not-too-distant future. This improvement in time noted in materiel developments since the war may be visualized more readily by showing, in figures, the extent of the gain effected. Specifically, let us compare the

75-mm. gun, with a muzzle velocity of 550 meters per second, firing H. E. shell armed with the 24/31 fuze, with the 3-inch, 2600 foot-second, M-1 gun, firing H. E. shell armed with the Mk. III fuze. Assume a vertical circle struck with a slant range of 6000 yards from the gun. Then the following tabulation will show the time-of-flight differences of the two guns at that slant range and at the various altitudes listed:

Altitude yards	*Time of flight seconds* 75-mm. gun	*M-1 gun*	*Decrease in time of flight* seconds	*per cent*
5500	27.0	14.0	13.0	48
4000	23.8	13.8	10.0	42
2000	21.2	13.5	7.7	36
0	19.7	13.2	6.5	33

If, to make the story complete, the two dead times be added so that predicting interval rather than time of flight is shown, the results would be:

Altitude yards	*Predicting interval seconds* 75-mm. gun	*M-1 gun*	*Decrease in predicting interval* seconds	*per cent*
5500	35.0	14.5	20.5	59
4000	31.8	14.3	17.5	55
2000	29.2	14.0	15.2	52
0	27.7	13.7	14.0	51

If the improvement in fire, as represented by these percentages, seems large, as indeed it is, consider further that our own 105-mm. gun, with a velocity of 2800 foot-seconds and a heavier projectile than the 3-inch gun, has a predicting interval that varies from about 10 per cent less at low altitudes to over 40 per cent less at high altitudes, as compared with the M-1 gun. In time of war the 105-mm. gun would be fired at 3000 foot-seconds which would result in still more of a decrease.

These enormous time improvements do not affect the probabilities of gunfire—they do affect vitally the probability of prediction. In time of war an aviator is not constrained to adhere to the predicted course and there is no power available that enables us to predict on the aviator's mind. However, the shorter the predicting interval, the less opportunity the aviator has to change his mind and his course before the prediction culminates in a group of bursts. For this reason the decreases in time mentioned above will be probably the greatest factor, in the event of war, in producing an increased number of hits over past records.

A second decided materiel progress is in the perfection of Case III methods of fire by means of follow-the-pointer dials for laying the gun in azimuth and elevation. Captain K. M. Loch, R. A., in his 1927-28 "Duncan" Gold Medal Essay (*Journal of the Royal Artillery*, July 1, 1928) states that "experts abroad regard it as a method at least 100% advance on any other." Captain Loch, an inveterate student of antiaircraft matters and a chronic winner of the "Duncan" essay, is cautious about going that far himself, but he strikes the nail squarely

on the head none the less. By the follow-the-pointer dials the accuracy of fire is increased directly through the increased accuracy of setting the firing data on the guns, as contrasted with the old sighting systems. This one feature is but a starting point in the ennumeration of advantages. There is the greater accuracy of following the target, the greater ease of putting the battery rapidly on target and holding it there, and many other advantages that enter in one way or another to increase the accuracy of fire and the certainty of firing. Let those officers who have fired, with gun sights, at a sleeve 7000 yards away in a haze, with a head wind blowing smoke and dust into the gun sights, and who, after waiting in vain for all four guns to report "on target," orders fire from half of the battery, only to loose the target from the firing guns on the first rounds—while the range section continues tracking—let those officers write a good definition of "certainty of firing" as here used.

In position finding, great advances in accuracy have taken place. The standard equipment now consists of the Director M-1 (Vickers) and the 4-meter stereoscopic height finder. In those instruments, the probable error of position finding has undergone considerable reduction.

The accuracy of fire of a battery may be gauged by the probable error of fire, which is the combination of the probable errors of the gun, of the height finder, and of the data computer. The probable error of fire, under average conditions and with the new materiel, is now about 80 yards in range along the trajectory. It is debatable whether or not it is desirable to decrease this figure, for it may be seen that a certain amount of dispersion is essential to absorb deviations in course of the target during the predicting interval and for firing at targets in formation. In other words, the nature of the target requires not a high percentage of hits but rather a high certainty of hitting. It is probable, however, that the gunnery end can be treated with greater success if the probable error of firing be reduced to a minimum and deliberate dispersion introduced if and to the amount found necessary. New clockwork fuzes and year-to-year improvements in propellants will reduce the gun probable error. The data-computer and height-finder probable errors are continually under fire and new instruments under design or already built should result in a diminution of these two figures. It is expected that the probable error of fire will be reduced shortly to about 40 or 50 yards.

Following this brief resume of the materiel situation in its effect on accuracy, we come naturally to a consideration of gunnery. It was the dictum of our French instructors, during the war, that "antiaircraft fire must be prepared—it cannot be adjusted." Their process of reasoning in arriving at that important doctrine was logical; their conclusions sound. Even today, with all our marked advancement in materiel and methods, the best we can do in revising that doctrine is to say that "antiaircraft fire must be prepared so that adjustment, which may be exceedingly difficult, will be unnecessary." Pages could be written on the pros and cons of adjustment, but it is not intended to enter that discussion here. Suffice to say that the fog is gradually lifting on the adjust-

ment question and adjustment of fire is possible, at least under certain conditions. In exactly what percentage of engagements it will be possible is a figure shrouded in the mists of futurity. To most proponents of adjustment it seems, quite logically, that (having prepared the fire) to continue firing at a target without result and with no attempt to adjust borders on inaction, an unforgivable military crime.

When we were told that antiaircraft fire must be prepared, with what problem were we confronted? A point in space must be selected and a series of bursts fired at that point, the location of each burst being computed and located by very inaccurate means. The deviation of the bursts, as represented by their determined C. I., from the point selected is due to the inaccuracies of locating the bursts; to errors in the firing tables; to non-standard muzzle velocities, caused by peculiarities of the powder lot, erosion of the gun, the temperature effort on powder, and other variants affecting muzzle velocity; to variations in weight of the projectiles; to elasticity effects; to wind; to drift; to rotation effects; to variations in density and in the moisture content of the air; and to any of the other causes of non-systematic error that might prevent the attainment of a true C. I. in the few rounds fired, or causes of systematic error that impel the C. I. to refrain obstinately from falling where it should. The summation of all these innumerable effects is a distortion of all trajectories, for which complicated changes, flat corrections made at one point in space, were supposed to offer a correction! It is true that something was known about wind and drift effects and approximate corrections for these two could be applied, but even if accurately applied, these corrections would be lost in the maze of the unknowns. The problem was incapable of so simple a solution then and is incapable of so simple a solution now.

The proper opening wedge to drive into this knotty question is one to reduce the most important ballistic variations to known and accurately applied corrections. The Director M-1 (Vickers) computes and applies its own wind and drift corrections. Muzzle velocity corrections may be effected by placing charts for the specific muzzle velocity obtained on the time-of-flight and altitude-fuze range drums. To determine the muzzle velocity developed the field chronograph has come into being and the Ordnance Department has caused to be published the differential effect of temperature on the powder.

A data computer constructed by the Ordnance Department, and now undergoing further development and perfection, is of such design that ballistic corrections are made with greater ease and accuracy than is true of the Director M-1. In addition to the automatic application of wind and drift corrections, muzzle velocity corrections may be made instantly by setting the desired value on a scale graduated in foot seconds. Furthermore, a ballistic coefficient correction is provided whereby the battery commander may take cognizance of variations in the ballistic density.

Quite a few sources of systematic error remain, but a large bite has been taken from the total number and the trial-shot problem has been reduced in complexity thereby. An extensive trial shot study has just been completed

which includes in its scope not only the most accurate means of applying trial-shot corrections that would be sensibly true throughout the varying conditions of fire, but also a practical field solution for the problem of locating the bursts in space accurately.

The subject of training in all its varied aspects, next in order for consideration, is one that is impressed on the soldier from his military infancy. It is unnecessary to dwell on training and its effect on accuracy here. There remains for examination the subject of opposition.

It has been stated that accuracy of fire is the result of innumerable small cogs running together to operate the entire machine. *Opposition* may be likened to the sand which an enemy will throw in those cogs. It has been told of a duelist who prided himself somewhat as a pistol shot, that he was wont to remark that he could break the stem of a wineglass at twenty paces. He was reminded that the fact of the wineglass being unable to shoot back must be given full consideration. So it is with the antiaircraft (or any other) battery. It is one thing to fire calmly at a sleeve target towed by a friend. It is quite another thing to fire when one or a score of enemy planes are buzzing around spitting lead at the battery. The same is true of the pilot, of course, who cannot be expected to bomb or machine gun with the same accuracy under fire as under target practice conditions, but that is beyond the scope of this paper.

It may be accepted as a fact that antiaircraft accuracy has made great advances since the war. It may be accepted equally that these advances have not passed unnoticed by air officers the world over. To think otherwise would be to underestimate a possible antagonist—a process frowned on since time immemorial. Whereas in the past the aviator has considered avoiding antiaircraft fire by defensive means, he is now contemplating the offensive. We may be assured, if the antiaircraft defense of the future proves as effective as its followers believe, the offensive will be a violent one indeed.

The defensive protection available for aviators includes, first of all, the avoidance of defended areas. It would be foolhardy in an aviator to fly near a group of antiaircraft guns, *unless his mission carried him there.* The bombardment plane, for example, must meet antiaircraft guns eventually if it is to attack a target of any consequence, since all such will be defended, but it need not fly through several other defenses en route to its objective if a course can be mapped to avoid them. Any change in speed, altitude, or direction of flight is a defensive measure, as is the judicious use of clouds, mist, or fog to screen air movements. Protective coloration and muffled motors fall in the same category. Unfortunately (from an air viewpoint) the necessity for adopting the more effective of these measures would prevent the accomplishment of some missions, delay the execution of others, and would be in any case a considerable nuisance. Furthermore, formation flying must be protected, and such flying, in the face of an unhampered antiaircraft defense, is going to be hazardous, to express it mildly.

The considerations of increased accuracy of antiaircraft fire and the objections that exist to defensive measures alone will put aviators "on the prod,"

to use an apt western expression. The excitement, nervous tension, curiosity, divided attention, and eagerness for immediate visible results always has and always will be present in combat to more or less degree. It should not be confused with fear. The effect is intangible. By training, by simplification of the gunners' tasks, by careful emplacement, by the maintenance of a high morale, and through experience, the effects of opposition may be minimized. Possible forms of opposition and the necessary counter measures will be considered at various points throughout the remainder of this discussion.

Let us now return to the original maxim, from which we have deleted the word accurate:

An efficient battery is a battery
(1) *that can be moved in time to the proper firing position*
(2) *with sufficient ammunition*
(3) *and can remain there*
(4) *and be prepared to deliver fire*
(5) *on the proper targets.*

As thus arranged, the attributes of an efficient antiaircraft battery may be considered in detail.

(1) *that can be moved in time to the proper firing position*

We are concerned here with the question of mobility. The dictates of the selection of the proper position will develop naturally with the consideration of other attributes.

A surprising number of people visualize a mobile antiaircraft battery as a thing of great similarity to a fire department, dashing madly across the country to meet a reported plane, perhaps firing as it goes, and returning to its lair at the conclusion of the festivities. The picture is, of course, erroneous. The antiaircraft battery is not concerned with putting out a fire; rather its function is to prevent the fire from starting, to continue the comparison, and its mobility must be greater and of a different sort than that of the fire-fighting vehicle. The mobility of which the battery must be possessed is of two kinds: march mobility and cross-country mobility.

The march mobility of an antiaircraft battery has to be of a high order that it may accompany and defend troops—even mechanized troops—on the march. To accompany the troops requires only a parity in mobility between the two, but to defend the accompanied units demands much more in the antiaircraft battery. It is contemplated that about two-thirds of the defending units will be halted and prepared to fire at all times. The remaining third will be occupied with passing the column so that it may take up position at its head and be prepared to fire until the rear of the column shall again catch up with its position. To accomplish this maneuver of advancing the rearmost battery or batteries and to permit two-thirds of the defense to be in position for action at all times necessitates, in the antiaircraft battery, at least three times the speed of the defended column, and a safety factor above that is to be desired. Furthermore, it is evident that a given strength of defense can be maintained by fewer batteries if the mobility of the batteries be high. These

considerations entail an effective road speed of at least 8 miles per hour for defending foot troops and 15 miles per hour in the case of cavalry units.

It has not been easy to maintain the mobility of antiaircraft batteries at the desired figure, for the using service has been calling lustily for greater muzzle velocities and greater stability since the war. Conformity with these demands brings with it greater weight and, normally, less mobility for that reason. The new M-1 gun, a direct answer to all requirements, appeared on balloon tires, though it weighed about 19,000 pounds. With it came a commercial four-wheel-drive prime mover, also on balloon tires, that seems to be its proper companion. This vehicle (the Coleman 5-ton truck) has eight speeds forward and a speed range of from almost nothing to 35 miles per hour. The two together have averaged over 15 miles per hour in hilly country, during a trip of about 150 miles. The definite speed figures of the unit cannot be given until after more protracted tests, but it appears now that 12 miles per hour may be expected with confidence and over 15 miles per hour attained, at least for short periods if desired. This road speed affords the mobility desired in an antiaircraft battery.

At this point there enters a consideration quite beyond the power of the antiaircraft personnel to solve, as it is a function of higher command. Being provided with guns of sufficient mobility, will we be enabled to use that mobility on the roads? The commander charged with the organization of the march of a large force is confronted with an unhappy situation even in the most thoroughly developed districts. There aren't sufficient roads to go around. However, "where there's a will—." It is suggested that the commander who fails to provide for the movement forward of his antiaircraft units will find a way immediately subsequent to the first attack from the air on his column.

The cross-country mobility of an antiaircraft battery includes its ability to use inferior roads, to cross fields, sandy or muddy stretches, shallow ditches and, in general, to go to the exact place where its presence is desired without regard to the intervening terrain.

It is not a very great exaggeration to state that the new unit (prime mover and gun) may disregard roads entirely when speed is not vital. The unit is not amphibious and cannot fly; it cannot climb trees or penetrate swamps; but it can meet any other test of mobility within reason. The balloon tires of the gun and prime mover, together with the speed ranges and power of the prime mover have produced this result. The service is familiar with the 1918 gun, which is equipped with solid tires, and with the present F. W. D. prime mover. To obtain a direct comparison of the old and new units, in recent tests, the new unit was maneuvered successfully through a soft field. The old unit failed at the edge of the field. The new prime mover then made the attempt with the old gun, and failed, and the new gun suffered the same fate coupled to the old prime mover. At the time of this test the M-1 gun weighed about 19,000 pounds and the new prime mover was loaded with 5000 pounds of ballast. Since then, the M-1 gun has been lightened materially by the substitution of

duralumin outriggers for the cast steel outriggers of the pilot mount. It will be recalled the 1918 gun weighs slightly over 14,000 pounds.

It seems that experience gained so far with the new mobile unit warrants the conclusion that it can be placed where it is needed at the time it is needed, even over very difficult terrain.

(2) *with sufficient ammunition*

The nature of the target that must be engaged has led to higher muzzle velocities and greater rates of fire. These attributes form the basis of sound gun design. The first characteristic entails heavier and bulkier rounds and the second necessitates an increase in the quantity that must be supplied. The two together add greatly to the complication of this phase of logistics. We have been given better guns, but the problem of ammunition supply has become, thereby, more difficult of solution.

This may be viewed from a different angle than that suggested above. It might be claimed that the greater efficiency of the weapons arising directly from the increased size of ammunition will result in an augmented defensive result from the firing of a smaller number of rounds than was necessary formerly to accomplish a given end. This assumption leads to the conclusion that the overall expenditure of ammunition, by weight or volume, throughout a campaign, would be about on a parity with that of the World War. This is interesting to consider and logical, so far as it goes, but it does not present a complete review of the question. The air activity of another war would be far more intense than that of the past conflict and antiaircraft batteries would be in action more frequently.

What shall be prescribed as a days allowance of ammunition? In the French antiaircraft service, during the war, it was deemed advisable to maintain the battery supply at 1000 rounds per gun. That such an allowance was ever fired in one day seems unlikely, but in the stabilized situation then obtaining, the maintenance of a supply of this size offered no insuperable difficulties, and it allowed a margin of safety against possible interruption to the service of ammunition supply. Now, however, we are confronted with four gun batteries instead of two, and with ammunition roughly twice as large as the 75-mm. ammunition. Using the same figure of 1000 rounds per gun we should be required now to maintain 4000 rounds at the battery. This amount of ammunition, boxed, comprises the load of 32 of the present ammunition trucks. Thus, but one-eighth of the total allowance could accompany the battery in its fifth section (of four trucks) or, if the battery share of the combat train's twelve trucks be included, a maximum of 1000 rounds, the allowance for one gun, could be carried with the battery. It will be recalled that the combat train may be subdivided and the ammunition sections accompany the various batteries at the discretion of the battalion commander. Either the figure of 1000 rounds per gun is excessive or the number of ammunition trucks available is insufficient.

Let us examine into the firing time represented by 1000 rounds per gun. The M-1 gun has a prescribed rate of fire of 25 rounds per gun per minute. The

battery should fire 100 rounds each minute of action and 4000 rounds represents a battery firing time of 40 minutes. While a total action time of this magnitude may be encountered in times of a hostile attack of importance, the figure is probably high to be used as an average. Generally, an individual action should have a duration of less than a minute. It should be terminated within that time for one of the following reasons:

(a) The target is damaged or destroyed

(b) The target passes out of range

(c) The target becomes obscured

If the target adopts defensive flying—which is likely—this by no means signalizes a termination of the action, but the battery commander should adopt volley fire at once, thus decreasing the ammunition expenditure. If the attack be made by a force of considerable size with a will to proceed regardless of losses, then the action will not be limited to any figure. We should except from this time limit, also, the high-flying pursuit plane until such time as more is known of the results to be expected in the highest regions. In the light of present knowledge, and considering the average condition, it seems reasonable that the battery commander should so adjust his fire within a minute as to cause termination of the action or to enforce defensive flying on the aviator. If this be true, 4000 rounds represents some sixty engagements throughout the day—a not inconsiderable day's work.

Some authorities favor prescribing a day's allowance of 300 rounds per gun. This is within the carrying capabilities (approximately) of the present assignment of transportation. The total of 1200 rounds represents a battery firing time of twelve minutes and some fifteen to twenty individual engagements. This, certainly, does not allow any factor of safety.

The situation will be improved somewhat, if the new gun prime mover be assigned for duty in ammunition haulage, which is a logical corollary since the mobility of the ammunition must be equal to that of the guns. Instead of carrying about 125 rounds per truck, these vehicles may be loaded with about 225 rounds. Thus 900 rounds may be carried with the fifth section and 900 more with the battery section of the combat train. Surely we can squeeze 200 more rounds in and say that 2000 rounds can be carried with the new batteries equipped with the present number of ammunition trucks, and that they will be able, thereby, to fire for twenty minutes or to participate in some thirty engagements. This figure seems a reasonable one.

If the estimations and deductions used herein have not been incorrect, the ammunition situation may be summarized somewhat as follows:

(a) There should accompany the battery, in its own and the combat train vehicles, a total of 2000 rounds. This may be accomplished if the new vehicles recommended for antiaircraft use are issued in the same numbers as now allowed.

(b) In times of impending enemy attack the battery supply should be maintained at 4000 rounds.

(c) Mobile batteries temporarily demobilized by being assigned to the

defense of important utilities not likely to be moved by fluctuations of the battle line should be allowed 4000 rounds at the guns.

(3) *and can remain there*

It has been charged that the antiaircraft gun is developing its offensive power to the neglect of offensive action that may be taken against it and to the detriment of the probable efficacy of the battery. Certainly there is some truth in the accusation. How many batteries, in training, have prepared complete positions? How many have been fired from any but an exposed position without attempt at concealment or protection? The impetus given to antiaircraft development by the Aberdeen tests has been tremenduous and it is undoubtedly true that the striking power of the weapons has forged far ahead and that defense has been neglected. However, one thing at a time! The improved weapons are a fact. It would be well, now, to devote time to insuring that a good battery, once emplaced, can remain there, for certainly no striking power can come from a destroyed gun and very little from a gun always on the move. For various reasons the Aberdeen tests could not have been held with equal success elsewhere. This is not so of defensive tests. The batteries in service should be studying and practicing the art of protection in all its many phases. It has been stated elsewhere in this article that a future conflict would find air units decidedly "on the prod" where antiaircraft is concerned. Now is the time, in conjunction with our own Air Corps, to discover the probable nature of the air offensive action and the best answers thereto. The two arms should maneuver together to the end that our own planes would be in minimum danger from hostile antiaircraft and hostile planes in maximum danger from our own antiaircraft.

The most efficient antiaircraft battery, in respect to the attribute now under consideration, and which may be called permanence, is one that remains in position and can fire during the entire duration of the tactical siutation that requires its presence in that site. It lacks permanence, within our meaning of the term, when the guns are destroyed or damaged, whether through artillery or air action, when the position is rendered untenable from the same causes, and when the guns become too worn for effective firing.

The last-mentioned factor has been solved admirably, in the new antiaircraft guns, by the inclusion of the removable liner in its design. High velocities entail rapid wear. Rapid wear, without some solution like the removable liner, means loss of firing strength while guns are being re-tubed at Ordnance repair parks. The removable liner may be changed by the personnel in the field without special tools and an old gun metomorphosed into being a new gun in about half an hour.

Loss of permanence through artillery fire is a subject continually brought to the attention of the artilleryman, antiaircraft or otherwise. The antiaircraft battery is likely, in a future conflict, to occupy an unenviable position of prominence. In the face of a projected enemy drive, it is very possible that the enemy high command will pass down word to his artillery staff that the opposing antiaircraft batteries must be put out of action for the greater ease of

accomplishing the air missions incident to the drive. Since there are but three batteries within each Corps, normally, each battery may be the recipient of a not inconsiderable bit of violent attention from the artillery across the line. For a well known receipe, however, we are advised to "first catch our rabbit." The battery must not be seen. Here comes the first rub, for an antiaircraft battery, by the nature of its mission, is compelled to fire at the one time when the disclosure of its position is most likely—when hostile observation planes are above. The task of the observation plane must be rendered most difficult by the selection of the site for the battery and by concealment and protective emplacing.

It is not intended to enter into the tactical considerations behind the battalion commander's selection of position. Rather are we concerned with the battery commander's survey of the terrain. The battery should have, approximately, a firing field from 0°to 90° in elevation and 360° in azimuth. The qualifying word allows for the difference between the ideal site and the one that caution and a regard for permanence dictates. Certainly a battery must not be under direct observation from possible ground stations within enemy territory and the lowermost 15° or 20° elevation toward the enemy must be sacrificed in the interest of defilade. The 360° traverse cannot be sacrificed unless the exigencies of the situation force a battery into position in woods, a village, or elsewhere where 360° is not attainable under any circumstances. It should be recognized, in so siting a battery, that its efficiency is impaired thereby. It is essential that possible registration points be avoided. It is no longer necessary that the position be on or near a good road, due to the cross-country mobility of the new guns. In fact, it would be well to avoid roads as being likely sources of fire and of interfering noises.

Consider, next, the possibilities for concealment. The model 1918 gun is as difficult to conceal as a gun may be without special efforts in that direction. It projects up out of the landscape like a lighthouse on the shore. The M-1 gun, when emplaced, squats down nicely on the ground, has a low trunnion height, and lends itself readily to concealment. The best possible terrain is that covered with scrub growth rising to the height of the trunnions. The outriggers, which stretch out like a spiders legs, will be covered by the natural growth. To each gun must be attached a camouflage framework, sufficient in extent to cover the gunners' platform and free to revolve with the gun. Natural materiel on the framework, frequently renewed, will produce the best results. The framework must be so constructed that the gun elevates in a slit left for that purpose, the slit being closed by a flexible strip of the camouflage materiel which will follow the movements of the gun in elevation or depression. Vision from the gun emplacement need not be provided in case III installations.

The foregoing is far from being a complete survey of the subject of camouflage, but it furnishes a brief reference to the peculiarities of the antiaircraft situation which will not be found in published regulations dealing with camouflage. An antiaircraft battery can be concealed and fired without detection,

particularly in the maze of artillery in action during a battle. The permanence of the battery depends on it.

Concealment is but half the story. The guns must be emplaced with the idea in mind of their eventual detection, and every precaution taken to protect men and materiel alike. A sandbag wall surrounding each gun is the most ready form of protection. It is the least that should be done. A better solution may be found in emplacing the guns on a slope and digging in so that the guns are mostly below ground level on three sides. The fourth can be closed by sand bags. Let the battery commander exercise his ingenuity in accordance with the terrain available to him. With the guns securely installed and the range section practically below the level of the ground, the battery may be made secure except against a direct hit. When every possible precaution has been taken and the battery commander feels that he may remain in position forever, then is the time to prepare an alternate position ready for immediate occupancy. The defended elements expect continued antiaircraft protection and they must be afforded continuous protection. To be caught napping with nowhere to go is inexcusable.

The foregoing assumes that time for the preparation of the emplacements is available. Often this will not be the good fortune of the battery, and occasions are not difficult to conceive where the battery must dash from the road and be ready to fire in a minimum of time. Even then, a judicious use of the terrain for concealment still affords the battery commander an opportunity to give his command a goodly measure of protection. The situation in which a battery cannot be allowed time to complete its emplacements is probably one in which it will not be required to remain in the position long—as in the case of the protection of troops on the march—and destruction by artillery fire, or from the air either for that matter, has less likelihood of happening.

In so far as the actual construction of an emplacement is concerned, consideration of possible air attack on the battery should lead to exactly the same construction as that designed for protection against artillery fire. If a battery be given every possible protection against terrestrial fire, then nothing more can be done, by emplacement construction, to protect it from the air. Overhead protection is not practicable, and a direct bomb hit will have the same disasterous effect as a direct shell hit. Bomb fragments, most to be feared from the air, are guarded against, in so far as may be, by the protection against shell fragments. If the attack be delivered by machine guns, then the defense must be by the same weapon, which, in this particular sort of duel, is not at a great disadvantage because of the great mobility of the attacker. Let it be noted that to machine-gun the battery the plane must approach to within accurate range from the machine guns of the battery. If the plane maneuvers so as to be a difficult target for the ground machine guns, that same maneuvering renders the battery a difficult target for the plane to hit. If the plane comes within range of the machine guns for but a matter of seconds, then, in turn, it can be machine-gunning the battery but a matter of seconds. In a machine-gun

duel, the battery can take its chance, gun against gun, but against the bomb it must protect carefully by emplacement.

This is an antiaircraft gun treatise and, in introducing the machine gun therein, the reference is to the machine guns assigned to the gun battery for its protection and hence an integral part thereof. At this point we must digress a moment to survey, briefly, the antiaircraft defense as a whole. It is not presenting a true picture to consider a gun battery alone, as is being done here, for the antiaircraft regiment with all its components works for a common end. Thus, when we visualize a formation of attack planes skimming over the trees to attack a gun battery, let us visualize at the same time the continuous deep band of machine-gun fire that must be penetrated before the gun battery is reached. When a picture is drawn of an artillery regulation plane or of bombardment planes maneuvering to direct fire on or to attack a gun battery, let us not loose sight of the other batteries of guns and 37-mm. cannon that may bear on the same target at the same time. If a plane is obscured by the sun from one battery, it cannot be so obscured at the same time from all the others, and while intermittent clouds may hide a plane effectively from one position, that target may be presented clearly to the remainder of the defense. If we proceed, now, with an examination of the gun battery alone, it is with this truer and more complete picture in the background.

Direct action against the gun battery from the air may assume one of two forms, according to present knowledge; the attack may be delivered by bombardment planes or by attack planes. Probably the first may be discounted as being a very inefficient form of attack as viewed from the side of the hostile air force. The bombardment plane is a valuable and indispensable element in the air scheme of things, and should be sacrificed only where the possible gains are estimated to be commensurate with the possible losses. Such is not true, normally, of an attack on an antiaircraft battery. From the altitude at which the bombardment plane must operate to minimize the effect of fire from the ground, the antiaircraft battery is a target of really minute size and the probability of hitting thereon too small for any hope of great success. The bombardment plane will reserve its power for more appropriate targets.

It is from the attack plane that the antiaircraft battery may anticipate the greatest attention. The attack plane is relatively new to the air troops themselves and it is to be hoped that any inaccuracies in speaking of its tactics will be condoned. We may visualize the great air attack of the future as being delivered by the bombardment plane, with pursuit craft in protection above and the attack plane fulfilling the same mission below. During the delivery of the bombardment and in preparation therefor, attack planes will swarm over the countryside, seeking whom they may devour and making the air safe for their larger friends above.

The attack plane is to operate just above the tree tops. It is to appear suddenly before its target and swoop down thereon, one followed by another. A determined attack of this nature is not lightly to be passed over. Let us examine the possible counter measures.

(a) We are again reminded that one must "first catch his rabbit." Concealment is the first essential to success. In furtherance of this consideration, and bearing in mind that a battery destroyed is of no value, is it not logical to conserve that value by suspending action during the presence of the attack planes and thus avoid disclosing the position? If the attackers remain in the vicinity, returning again and again to the attack, such a course need not be considered, since the position is evidently known. In this case the battery should remain in action against the most important target present, whether the attacking planes themselves or another formation. The case of a formation of attack planes passing by in such a manner that there is little likelihood of hitting them with the guns, or when more important targets are aloft, may be regarded differently. Would it not serve the mission of continued defense best to lie "doggo" during the few seconds the attacking planes are passing and then resume activities? There are many pros and equally many cons. The answer should be found through extensive maneuvers.

(b) Avoid surprise. In siting the battery careful consideration must be given possible lines of approach for attack planes, and their ability to appear suddenly from over the trees or over a hill nullified. Where it is essential that a position near hills or trees be taken, then outpost listeners and outpost machine guns are vital. It has been stated, for example, that defilade from the enemy observation posts is necessary. The top of the hill forming the desired defilade must be the site of one of the battery machine-gun posts. Surprise is no less excusable in antiaircraft troops than in any other.

(c) The machine-gun training and organization must not be entirely subordinated to the gun training and organization. The machine gun is considered as secondary armament when assigned to the gun battery. Its importance should be equal to that of the guns for through the machine gun the guns will be enabled to continue their normal functions and the machine guns are forming a part of the entire defense scheme while they are protecting the guns. The strength and accuracy of the machine-gun defense of the guns should be such that attack planes cannot operate against the gun battery without very heavy losses. Note that the machine guns, dug down into their snug little holes, are as nearly immune from damage as a firing element may be. In the light of the new attitude of airmen toward the antiaircraft gun, it is not unreasonable to double the number of machine guns assigned to each gun battery. We must guarantee the permanence of the gun in position for the benefit of the entire personnel and materiel of the corps.

Before passing from the question of permanence and, of air action, it is desired to mention a possible form of air defense for the protection of the bombardment plane. It has been suggested that the perfection of smoke of the same weight as air and of the apparatus for laying the smoke from a plane has added another means for guarding the bombardment plane. It is proposed to lay screens of smoke between the gun batteries and the planes to be protected. Naturally, if the screens are properly placed, this would form an effective protection, for the batteries are not now prepared to fire at unseen

targets. If we disregard possible damage to the smoke plane, there remains the interesting task of interposing screens, in a wind, between three or more separate batteries and a constantly moving bombardment formation. The word impossible should be used with great caution in the present day of development, so let us confine ourselves to remarking that it appears to be a most difficult undertaking. The full possibilities of such a scheme could be developed in combined maneuvers.

(4) *and be prepared to deliver fire*

For a battery to be prepared to deliver fire, it is necessary that the emplacement and organization of the materiel be completed and that the personnel be on the alert. Both of these considerations have been treated somewhat in the pages preceding.

Between the desired extreme of completing a thorough emplacement before a round is fired and the often necessary other extreme of firing practically from the road, there are innumerable situations that may be met. We shall consider, briefly, the two extreme cases.

Very little need be added to what has gone before in respect to emplacement. Of several possible solutions to a march problem, for example, the regimental or battalion commander should favor that decision which most nearly affords the battery commander the time he needs to prepare his emplacements. We should now, throughout the service, set about discovering how much can be accomplished in a given time under different conditions of terrain. Carefully planned terrain exercises with full war strength and equipment are needed to furnish the antiaircraft commanders, present and future, the materiel with which to work in making their decisions.

The other aspect of emplacement, the actual maneuver of the gun, is a materiel aspect entirely. The specifications for an antiaircraft gun, as presented to the Ordnance Department, called for a highly mobile gun of at least 2600 foot-seconds muzzle velocity, with all-round fire and capable of rapid emplacement. The difficulty of applying all these desirable characteristics to one mount may be imagined, for an improvement in any one of the lines of development renders the task of advancing the other lines just that much more difficult. In the M-1 gun we find a well-balanced solution. This gun can be emplaced in almost any terrain in from seven to fifteen minutes. The companion range instruments can be set up while the guns are being prepared. Connections of the data cables should be completed by the time the guns have been levelled and there remains the orientation of the battery before it is ready to fire. This process, using a star or other infinite point for paralleling guns and instruments and an ordinary compass for orientation, should occupy from two to five minutes. All in all the battery can be prepared for firing in from fifteen to twenty minutes by trained personnel working against time. Naturally, one would like to see a battery that could be fired as soon as halted on the road, but we can't have everything, and the other requirements must be met. Fifteen minutes is a satisfactory figure.

The preparation of the personnel has been discussed under the caption "avoid surprise." An airplane does not materialize out of space. It flies to the point where it is discovered, and its physical progress may be noted. In addition to its normal watchmen in the battery command post, there must be the outposts mentioned before, to guard against surprise from low-flying planes. Each battery serves as an outpost for all batteries to the rear and for air units as well. The entire antiaircraft service should be organized so that, in the normal course of events, the approach of a target is known long before it comes within sight or hearing. Clouds render this ideal situation difficult of attainment, but they make the work of the antiaircraft intelligence service even more important, since only a fraction of the reports possible in clear weather can be made and each report is enhanced in value, relatively.

The consideration of this question is particularly interesting with reference to the defense of troops on the march. It is to be supposed that troops on the march will not normally be penetrating a zone of well-organized antiaircraft defense, but rather will be marching with their own defending units accompanying them. Surprise from the air might be disastrous to the marching troops. Is it not logically a function of the antiaircraft units, trained in the identification of aircraft, to prevent such surprise? The advance, flank, and rear security units of the marching body must have their counterparts in antiaircraft security units who, by pyrotechnic or other signals, afford to the troops time for self protection and to the defense units time for alerting the various batteries.

(5) *on the proper targets*

To be able to fire on the proper target entails that the personnel of the battery can see it, can recognize it for what it is, and that, of several possible choices, the battery commander shall know which target to engage.

It is unnecessary to dwell long on the subject of identification of aircraft. It is an art which must be practiced assiduously before a man may qualify as an observer. Gunners' instruction furnishes the foundation, but how many qualified gunners can identify correctly even the more common types of aircraft? Not only must the battery observers be capable of naming the nationality, type, and model of any plane at a glance, in time of war, but they must be able, as well, to determine the nationality and type from sound alone. In times of peace it should be routine in a battery that a corps of observers be available for use in tactical problems. Without qualified observers it may be impossible to obtain the maximum benefit from maneuvers embodying the use of different types of planes.

Selection of the target to engage is usually a function of the battery commander. In the normal situation he must act on his own initiative because of the lack of time in which to refer questions to the higher commander who may have a better grasp of the situation as a whole. For the exercise of this initiative the battery commander must be prepared by training in the principles of fire tactics. In time of action, or assumed action, he must be given a definite mission and his course of action thereafter must be first of all toward the successful accomplishment of that mission. Without attempting to lay down a

series of tactical principles, let us develop the problem further by assuming situations and making the battery commander's decisions.

(a) A battery assigned to the defense of a column on the march. A formation of bombardment planes is paralleling the column about three miles away. A formation of attack planes is approaching the column. The attack planes endanger the column immediately and must engaged first.

(b) A battery assigned to the defense of a corps in position. A major air offensive has been planned and a huge air force is being assembled in the air behind the lines. Higher authority assigns to the antiaircraft first consideration for this air force. Two large hostile formations approach, one of bombardment planes and one of pursuit planes. The pursuit planes should be engaged first and every effort exerted to break up the formation and otherwise decrease their effectiveness against our own air units. It might be reasoned that the air force being assembled will have pursuit strength sufficient to guarantee the success of the operation. This would have been considered by the authority that issued the order and he has decided to close every possible source of loss to the force in question. While the hostile pursuit formation may not endanger the success of the operation, it could destroy some of the planes participating therein and thus decrease the strength of the blow.

(c) A battery assigned to the defense of a railhead. Pursuit and bombardment planes approach. The bombardment planes should be engaged first.

(d) A battery assigned to the defense of a corps in position. Pursuit and reconnaissance planes approach. The latter offer the greatest immediate danger to the corps, through artillery regulation or photography, and should be engaged first.

In these assumed situations each of thc four general types of aircraft have been severally selected as the proper target to engage. It is not believed that the situations are far fetched nor the decisions illogical. It will be noted that no mention has been made of the size or maneuverability of the planes, nor of their particular presentation to the battery. Such factors cannot logically be governing when the essence of the battery commander's decision must be invariably the accomplishment of his mission and *not the building up of a high record of planes hit.* Before battalion commanders can take up the training of their battery commanders uniformly, in this regard, there is need for a clear and concise set of doctrines of antiaircraft fire tactics, tested, where necessary, by field maneuvers.

In one form or another we have discussed the major attributes of an efficient antiaircraft battery. An effort has been made to indicate those attributes of which our batteries are now possessed and those which require study, test, and field maneuvers for their further development. It has been claimed, in this article, that the antiaircraft battery is now an efficient battery—but even the most efficient battery cannot fire in two directions at once. The situation should be revised boldly and the tables of organization altered to allow more antiaircraft batteries to the corps.

Spotting and Plotting for Antiaircraft Artillery

From the Aberdeen Tests

I. Observation of Bursts

1. *Method of Measuring Deviations.* *a.* The problem of measuring and recording the position of the bursts of antiaircraft gun fire with respect to the target is of primary importance. The first method used in our service provided for measurements in range and in vertical deflection by means of a grid held by the observer in the towing plane. The observer was supposed to record his observations on specially prepared cards. Lateral deviations were read by observers on the ground. This system was hopeless. The aerial observer could never obtain but a small percentage of the bursts, recording was very difficult for him, and the synchronization of his results with those of the ground observers was impossible.

b. At Aberdeen during the antiaircraft tests a complete ground system was installed. This year two methods of obtaining deviation of bursts from the towed target were used; these were the camera method and the visual method. Since these two systems used approximately the same base line and the same orientation data, the deviations obtained by each could be compared. The course of the target could be plotted and results from each system computed. The two systems provided a check against each other, made certain that a course would not be lost should one system fail for any reason to obtain deviations, and permitted of a comparison as regards accuracy and the ability of each system to observe under various conditions of visibility and dispersion. For further data on comparison of visual and camera system see paragraph 14 of the Final Report, Antiaircraft Firings and Tests, Aberdeen Proving Ground, Maryland, 1928.

2. *The Camera Method.* *a.* The apparatus used in this method consists of two Bell and Howell B motion picture cameras, each mounted on the modified base of an azimuth instrument, M-1918. To the trunnion carrying the camera is attached an elbow telescope M-2 whose line of collimation can be made exactly parallel to that of the camera. Each camera is normally operated by a small motor and the two camera units are synchronized by means of a relay circuit closed approximately every second by means of a clockwork. A small electric lamp in the relay circuit marks the film of each camera at the same time as often as the relay circuit closes. One projector and the necessary developing and drying equipment are necessary in the laboratory. Specially prepared grid screens laid off to the proper scale for projecting the film are also required.

b. In use a camera unit is set up at each end of a base line whose length and azimuth is accurately known and the necessary telephone and synchronizing

circuits installed and connected. Each camera is accurately pointed at the target during the firing by means of the elbow telescope and pictures are taken of the bursts. The azimuth of the first and last bursts are read and recorded at each station. The film is then taken to the laboratory, developed, and projected from a projector onto a specially prepared grid screen from which the deviations in mils from the target can be read directly. The film from the camera at the battery position is measured for the mil deviations right or left and above or below the line of position to the target. The film from the camera on the flank position is measured for the mil deviations right or left only. The synchronizing device mentioned before provides a means of insuring that a given burst measured from the battery position is the same burst as measured

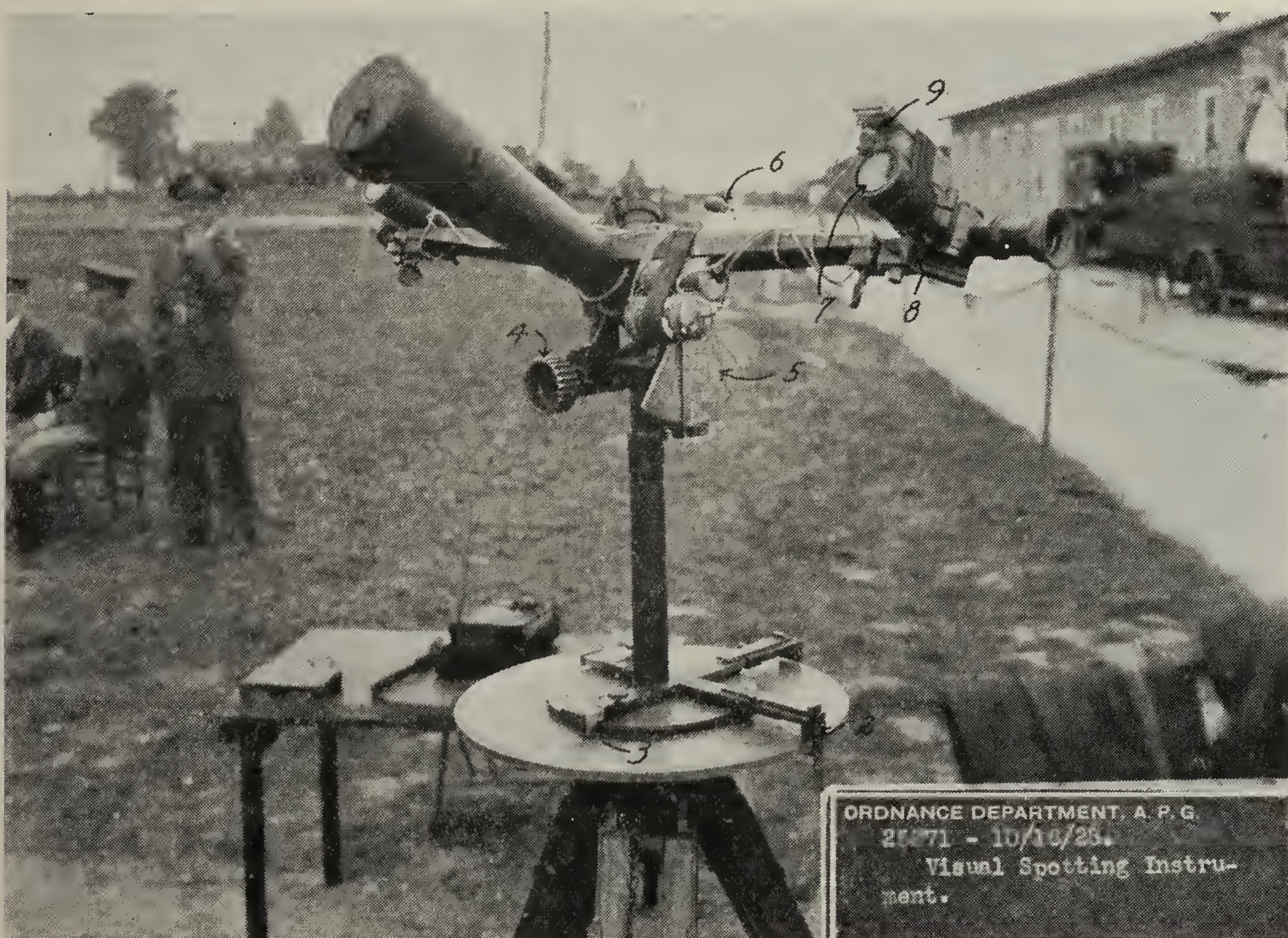

Fig. 1

from the flank position. For further information on camera see Section II, paragraph 14, and Appendix IV, Section A, Part 16 of the Aberdeen report.

3. *The Visual Observation Method.* *a.* This method is substantially the same as that used at Aberdeen Proving Ground last year and at various other stations. Two instruments are used, one at the battery position to observe lateral deviations (right and left) and vertical deviations (above and below) and one at a flank station to observe longitudinal deviations. As the instruments were located here so that the flank station was in prolongation of all courses, its results were overs and shorts though it is not necessary, to insure the success of the system, that this condition exist. It is however desirable.

b. The instruments used (Figure 1) consisted of two model 1920 antiaircraft telescopes each fitted with a cross arm which carried at each end a model

1917 gun sight. Each sight was so mounted that it could be adjusted in any direction and its line of collimation made to coincide with that of the training instrument. On the observing instrument (Figures 1 and 2) at the battery position one of the sights had the reticule turned through 90° so that vertical deviations could be read from it. The instrument at the flank station permitted of reading overs and shorts from either gun sight but as the magnitude of these deviations was usually much greater than those from the battery it was found better to have one observer read lines and shorts and another read overs.

c. To operate this system of observation it was necessary to devise a method of synchronizing the readings from all three observers. This was done by running two telephone lines from the battery observing instrument to the flank

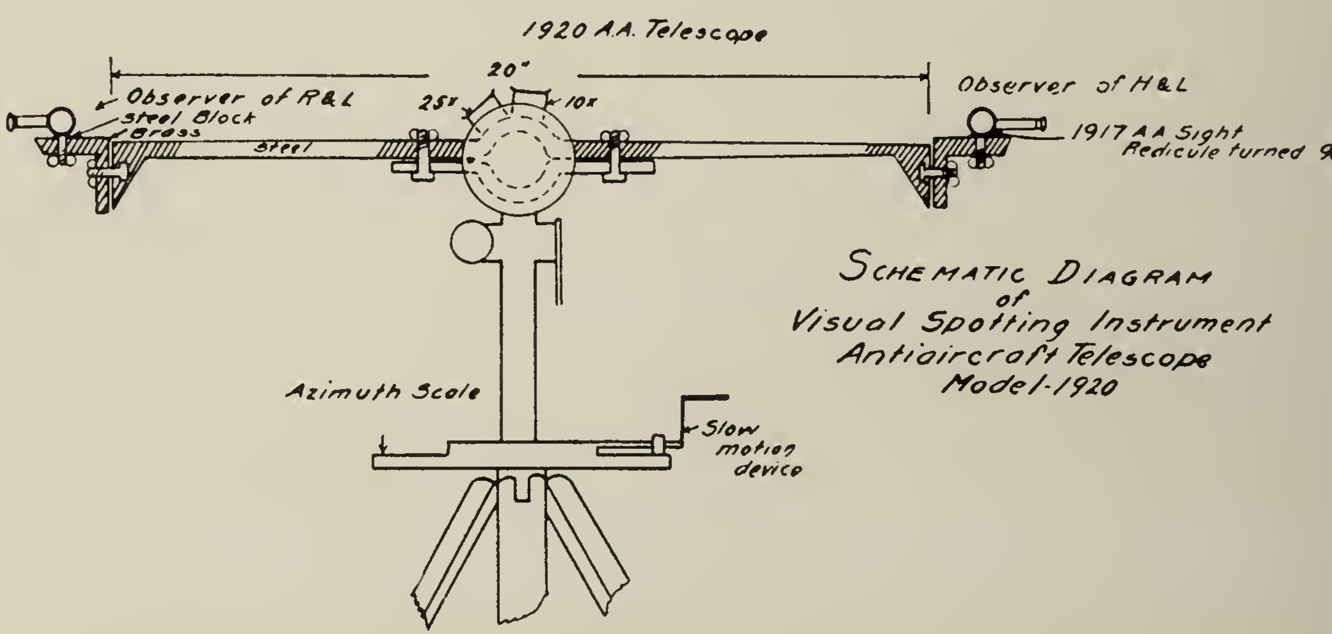

Fig. 2

station where the synchronizer (Figure 3) was located. This instrument consisted of a box containing two rollers on which was rolled a long piece of 40-inch tracing cloth, so that by turning the crank 1 (Figure 3) this cloth moved over the visible space at the top of the box and allowed the recorders to write the deviations received on the cloth. The observers at the battery observing instrument telephoned their observed deviations over their respective line to the recorders at the synchronizer who wrote them on the cloth as near the metal strip 5 (Figure 3) as possible. The logitudinal recorder received his deviations from the two observers at the flank instrument orally and recorded them as did the other recorders. Therefore, if all three deviations of a single burst were read and recorded simultaneously they would appear in a straight line along the tracing cloth of the synchronizer. This method of recording was much better than that employed last year when each observer had a separate reader who wrote down the readings as called by his observer and in so doing placed them opposite a figure determined by the time of burst. This time was indicated by a man with a stop watch who called seconds during the course. It is desirable to have the synchronizer away from the gun battery so that the recorders may not be bothered by the noise of gun fire. No difficulty was experienced in hearing and recording the deviations received over telephones.

One longitudinal recorder had no trouble in recording deviations received from two observers even though they did not prefix the words over or short to their readings since he could distinguish the observer by his voice. However, two longitudinal recorders could be used if needed.

After the course or the shoot was over, the cloth was turned back to the beginning and the deviations were read off and recorded on a suitable data sheet. Where a deviation from one station was missing from a line containing two others, that reading was considered lost. For a slow rate of fire (less than 50 rounds per minute) no difficulty was experienced in keeping the records

Fig. 3

synchronized, but above that rate a few bursts would be lost and a few would be out of synchronism. This was closely watched by comparing the visual results with the camera results, and in nearly all cases the synchronism would never be disturbed except for a few rounds.

d. To complete the data necessary for the final plotting and determination of hits, it was necessary that both observing instruments be carefully oriented before the firing and that an additional man at each instrument read the azimuth of the target at first and last burst or mark the plate of the instrument at these points and later reset the instrument and read the azimuths. These azimuths, with the direction of the course and number of shots fired, were recorded for each course.

II. Method of Plotting

1. *Introductory.* From the foregoing explanation it is seen that the same data are obtained from both camera and visual spotting units; *i. e.*, the deviations of the individual bursts and the azimuths of the target at the first and the last bursts, from each of the two terrestrial stations. From other sources the following data were obtained and used for the final plot of hits on the danger volume.

Altitude: obtained from the height finder.

Angular height: obtained from the height finder or B. C. instrument.

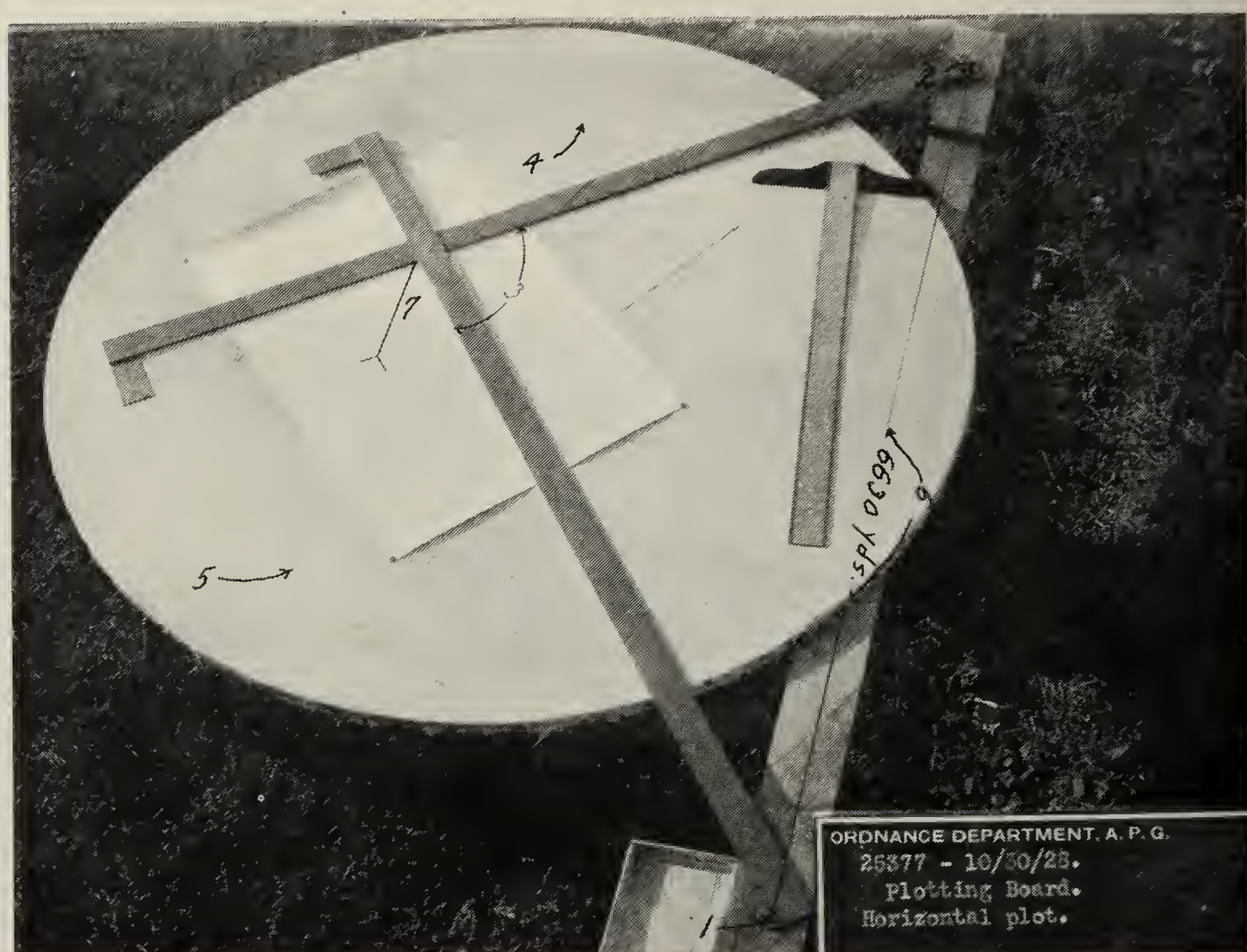

Fig. 4

2. *Horizontal Projection of Target's Course.* *a.* Having the azimuths of the target taken at the same instant from two accurately located stations, the horizontal projection of the target at that instant can be readily plotted.

b. For this purpose an improvised board with brass arms, one pivoted at each station, was used (Figure 4). The scale of this board was 1 inch equal to 100 yards. By use of the azimuth scales drawn on the board (4 and 5) the arms were laid at the azimuths of the target at the first burst and the intersection plotted. This, then, is the plot of the position of the target on the horizontal plane at the beginning of the firing on this course. Similarly, the position was plotted for the end of the course, using the azimuths of the target at the last burst. Assuming the target to fly in a straight line, a line joining these two

plotted points (7) is the horizontal projection of the target's course during the firing on that course.

3. *Horizontal Ranges and Mean Target Angle. a.* To plot accurately the position of each burst, it would be necessary to fix definitely the position of the target at the instant of each burst. This could be accomplished with an azimuth and angular-height recording device in the camera spotting unit as discussed in Appendix IV of the Aberdeen report. But without such a device, or when using the visual unit, only an approximate position can be determined. As a difference of one or two hundred yards in slant range or 10 mils in the target angle or angular height was found to make practically no difference in

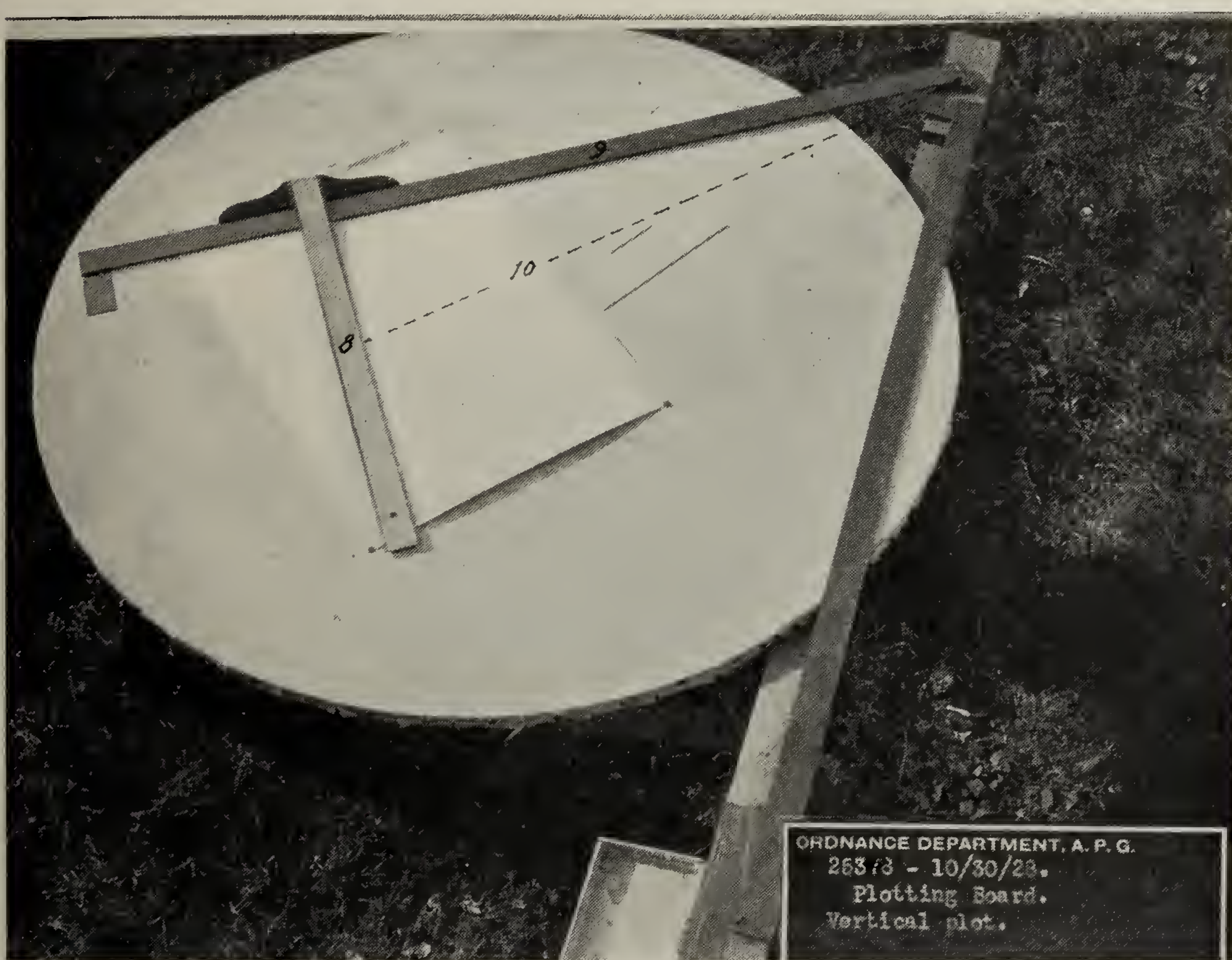

Fig. 5

the final plotting, it was decided to use the middle point of all courses or sections of courses as the mean position of the target. If the course was over 500 yards long, it was split up into sections and the center of each section taken as the target position. In this way much time and work was saved and the errors introduced by making the assumption that the target was at a mean central position on its course or section of course were much smaller than the errors involved in reading the deviations.

b. The brass arms of the plotting board were made to intersect at this mean point and the horizontal range from each station was read and recorded. The angle between the arms at this intersection, here called the mean target angle 3 (Figure 4) was read with a protractor.

4. *Slant Ranges.* *a.* As slant ranges from each observing station to the target were needed to convert mil deviations to yards, they were now plotted graphically, using the horizontal ranges just determined and the average altitude for that course as taken from the battery records. This was done on the plotting board previously described by setting a graduated T-square along one of the brass arms at the horizontal range 9 (Figure 5) and putting a pin into the board at the altitude 8 being used. The same arm was then swung over to this pin and the slant range 10 read off direct.

5. *Plot of Bursts in Horizontal and Vertical Planes.* (Figure 6.) Scale: 1 inch equals 50 yards.

a. By use of regular drafting equipment. (1) As some bursts were plotted by use of a scale and straight edge only, and that method will probably be used to some extent in the service until something like the xylonite plotter is issued or improvised, that method will be described first.

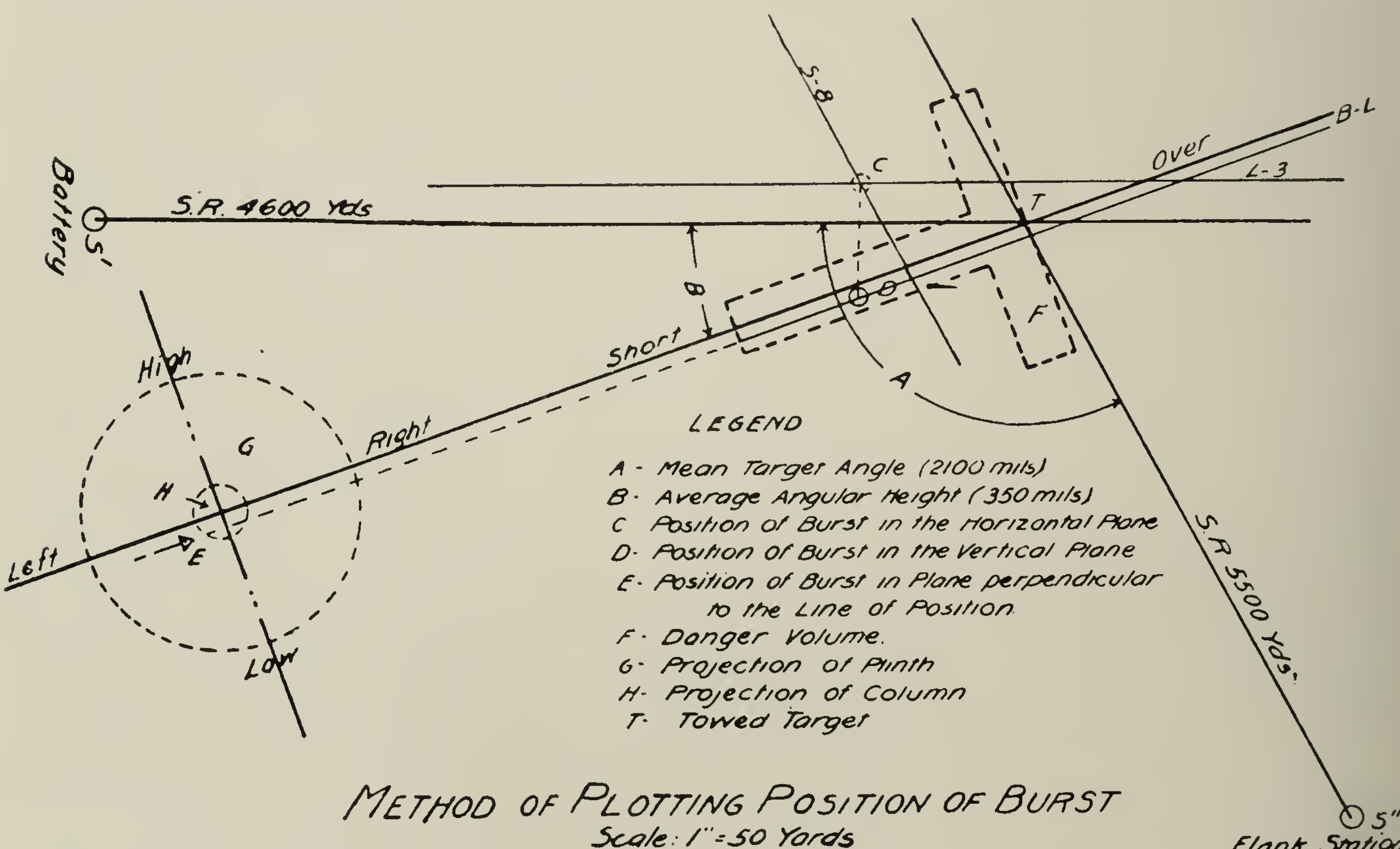

Fig. 6

(2) From a straight horizontal line $S'T$ (Figure 6), made to represent the horizontal projection of the battery target line, the mean target angle A was laid off at the target and $S''T$ drawn as the horizontal projection of the flank station target line.

(3) The lateral deviation in mils was converted to yards and this distance laid off perpendicular to $S'T$ in the proper sense, right or left. A construction line was drawn parallel to $S'T$ at this distance, which thus represents the horizontal projection of the line of sight from the battery station to the burst *L*-3.

(4) In the same manner the lateral deviation as observed at the flank station was laid off from $S''T$ and the construction line *S*-8 drawn. As these two construction lines are the horizontal projections of the lines of sight to the

burst from the two observing stations, their intersection C is the horizontal projection of the position of the burst.

(5) In determining the horizontal projection of the burst as just described, the plane of the paper was considered to represent a horizontal plane on the ground passing through the gun. To determine the vertical projection of the burst in the plane of fire, it is now necessary to consider the plane of the paper as representing this plane of fire. The target position T remains as before. The line $S'T$, originally representing the horizontal projection of the Gun-Target line, should now be considered as representing a horizontal line through the target and contained in the vertical plane of fire. If, now, the mean angular height as obtained by averaging the records kept at the battery be laid off from this horizontal line, the result will be the Gun-Target line or line of position in the plane of fire.

(6) A construction line was drawn parallel to this line of position B-1 in the proper sense and at a distance proportional to the vertical deviation in yards. Thus, this line was the vertical projection, in the plane of fire, of the line of sight from the battery observing station to the burst, and the vertical projection of the burst must fall somewhere on this line.

(7) Having the horizontal projection of the position of the burst and a line in the vertical plane on which it must fall, it only remains to transfer the horizontal projection C to this line, and the resulting point will be the projection of the burst in the vertical plane through the line of fire. As the vertical plane is the horizontal plane revolved about $S'T$, the target remaining fixed, a line perpendicular to $S'T$ through the horizontal projection of the burst C will intersect the vertical projected line of sight through the burst B-1 at a point D, which will thus be the projection of the burst in the vertical plane of fire.

b. By use of xylonite plotter and straight edge. (1) A xylonite plotter (Figure 7), submitted for test, was used to convert deviations to yards automatically, when set at the proper slant range. This was used for plotting to some extent and found to be much faster than the method of scaling deviations and drawing construction lines parallel to projected lines of sight.

(2) In this method the three basic line, $S'T$, $S''T$, and the line of position were laid out as previously described. The side edge 3 (Figure 7) of the plotter was placed parallel to $S'T$, with the target T (Figure 6) at the number 1 (Figure 7) equal to the slant range from battery to target. A straight edge was placed along the bottom edge of the plotter as shown in figure 8. This enabled the operator to move the plotter along this straight edge to set off any deviation, keeping the side edges always parallel to the line $S'T$ and the slant range set.

(3) To draw the horizontal projection of the line of sight through the burst it was only necessary to slide the plotter along the straight edge until the proper deviation line 2 (Figure 7) came directly over the target T (Figure 6). The sense of the deviation determines which side of the plotter to use. As this plotter was drawn to the scale to be used in plotting, as described hereinafter, and the edges have remained parallel to $S'T$, the edge on the side of the plotter

which was used was the horizontal projection of the line of sight through the burst from the battery position. A light construction line was drawn along this edge, which gives the same line *L*-3 (Figure 6) as previously described in paragraph (*a*) 3.

(4) Similarly, the plotter is set parallel to *S″T* and at the slant range from the flank station to the target. The deviation of the burst as observed from the flank station was set as described above and that part of the construction line *S*-8 (Figure 6) drawn that intersects the lateral deviation line. This intersection *C* (Figure 6) was the horizontal projection of the burst as described in paragraph (*a*) 4.

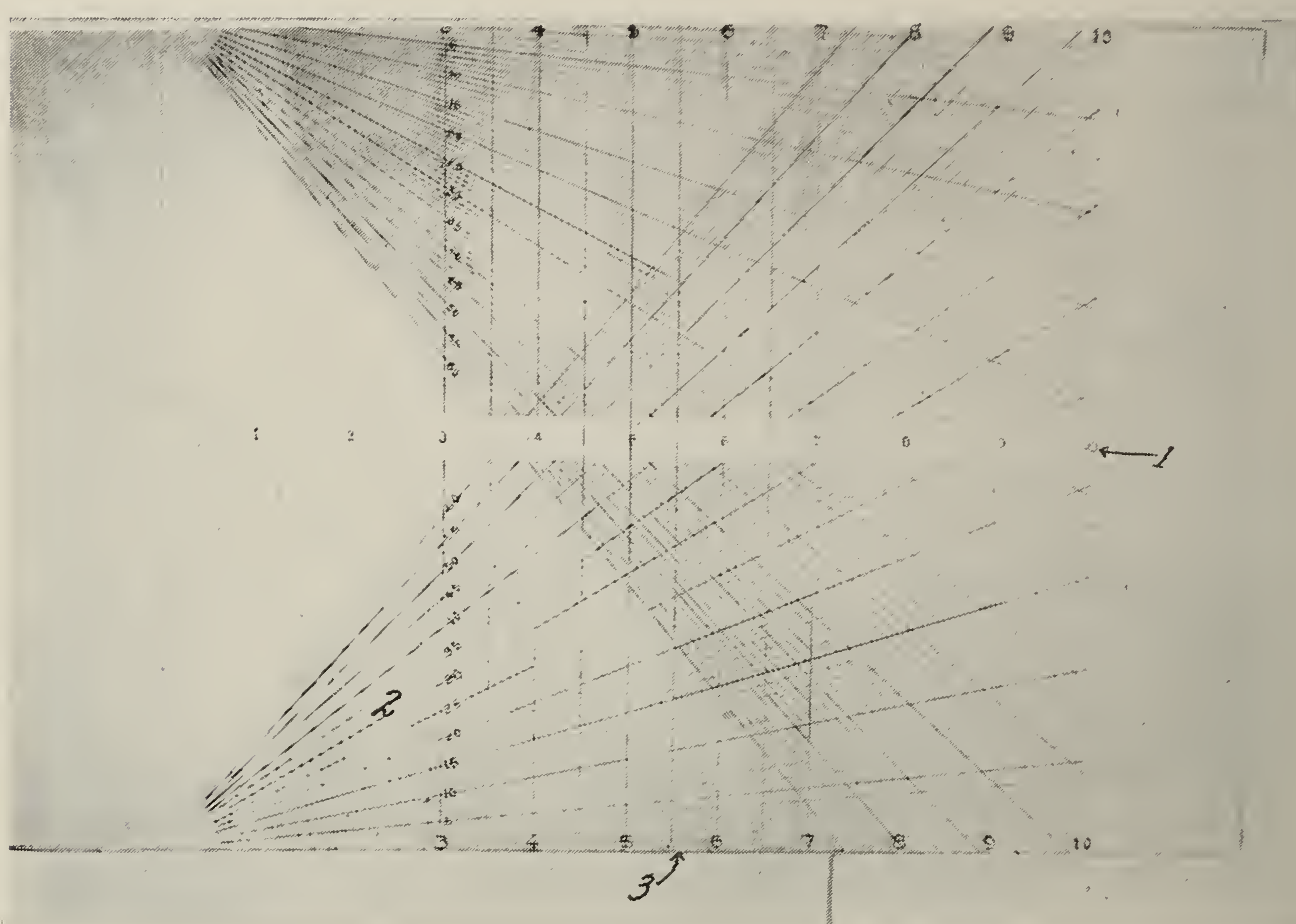

FIG. 7. XYLONITE PLOTTER

(5) Similarly, the vertical projection of the line of sight through the burst was drawn parallel to the line of position, and the point *C* (Figure 6) projected to this line, giving the vertical projection of the burst along the line of fire.

(6) The main advantage of using this plotter is that instead of plotting one burst at a time, ten or more can be plotted with each set up in very little more time than one burst. But care must be taken in properly marking the construction lines so that they can be identified.

c. By use of xylonite plotter and Universal Drafting Machine. (1) The xylonite plotter mentioned before was fitted, with an attachment which allowed it to be used on a drafting machine so that any edge could be placed parallel to any of the basic lines and clamped. Thus, in any position on the drawing board it would always be parallel to the line by which it was first set.

(2) To speed up further this work of plotting it was found that when the plotter was once set with the slant range over the target, a pin could be placed against its top edge so that by keeping it against this pin and sliding it along to the proper mil deviation line, the slant range remained set.

(3) To begin a plot of bursts, the same basic lines are laid out as in the first case. The plotter is first set with side parallel to $S'T$, clamped in that position, slant range set, and pin placed in board at top edge of plotter. Now the plotter is moved right or left as the sense of the deviations indicates, and to the proper mil deviation lines and light construction lines drawn along its side edge and numbered for each shot observed by the lateral observer on this course or part of course.

(4) Next, the drafting machine head is unclamped and the edge of the plotter moved and clamped parallel $S''T$. The new slant range is set as before and the flank station deviation construction lines are drawn to intersect the lateral deviation construction lines and these intersections numbered according to their shot numbers. These are the horizontal positions of the bursts.

(5) Again the drafting machine head is unclamped, moved so the plotter's side edge is parallel to the line of position, and clamped. The slant range from battery to target is set again as in the case of the lateral, and the vertical deviation construction lines are drawn and numbered.

(6) Then, resetting the plotter to the first position, with side edge parallel to $S'T$, use the top edge which is at right angles to the side edge to drop the perpendiculars from the horizontal projections of the bursts C (Figure 6) to the vertical construction lines. These last intersections are then the positions of the bursts in the vertical plane through the line of position.

6. *a.* In order to calculate the center of impact of the group of shots as plotted, the rights and lefts as well as aboves and belows are figured directly in yards from the mil deviations and slant range, and the bursts are then measured for overs and shorts. This measurement is along the line of position to a line or plane perpendicular to the line of position at the center of the towed target or, as shown on the vertical plot (Figure 6) along the vertical deviation construction line to the forward edge of the danger volume. This method of measuring overs and shorts differs from that used in previous years, as before they were measured along the horizontal to a vertical plane through the target. It is believed to be much better to measure them along the line of position, as that is a close approximation to the actual over or short on the trajectory line.

b. The next step, after making the vertical plot as described, is to determine the number of bursts that landed in the danger volume. This was done by superimposing a target F (Figure 6) drawn on xylonite to scale over the vertical plot with its center line along the line of position and its axis at the target T.

c. If any vertical projection of bursts such as D (Figure 6) is within this danger space, it then must be projected to a plane through the target perpendicular to the line of position. The danger space is first projected to this plane

in the manner shown in Figure 6, *G* being the projection of the plinth and *H* the column. The burst in question is then projected by a continuation of the vertical deviation construction line and the lateral deviation in yards is measured off from the vertical line through the projected danger space, shown in Figure 6 as perpendicular to the line of position. This gives the position as shown at *E*, which is the position of the burst as seen from the battery. Therefore, to be a hit this burst, if it landed in the plinth, must be in the plinth projected or if in the column, it must land in the projection of the column. In the example (Figure 6), the burst was not a hit although it was in the column as for range and vertical, but was not in the column projection for lateral deflection.

FIG. 8

d. In any case where a burst landed close to the edge of the superimposed danger space and had a chance of being a hit for deflection, it was replotted to a scale of 1 inch equals 10 yards. This practically assures a correct plot.

7. Another method of observing and plotting was submitted by the 64th Coast Artillery, but was received too late to be used, as it required the construction of a special flank observing instrument. This instrument is so designed that it observes the longitudinal deviations along the line of position. The bursts could then be plotted directly in the slant plane containing the line of position, using the impact charts made up for target angles for every ten or twenty mils. These could be constructed before the firings.

III. Spotting Instrument, Model 1920, A. A. Telescope

1. *Introduction. a.* With the adoption of a base-line system of spotting for antiaircraft artillery and no instrument issued for this purpose, it became necessary to improvise some instrument which could be used for observing lateral and vertical deviations from the battery position and rights and lefts from a flank position.

b. It was soon apparent that an observer cannot follow the target and at the same time observe the deviations of the bursts and it was therefore necessary to have this instrument trained by a separate observer. It was found also that one observer could not observe both the lateral and the vertical deviations with bursts occuring at a rate of one per second or greater. Therefore it was necessary that the instrument at the battery position have two observing instruments as well as a trainer's instrument. At the flank station the two observing instruments are not so necessary, as one observer can observe both rights and lefts. However, it has been found that it is best to have two observers at this instrument as well, one to observe lefts and lines, and the other rights, as the deviations are usually large as seen from the flank station, being, for all practical purposes, range deviations. It is quite difficult for one observer to watch both sides of his observing glass, especially when some bursts appear out near the edge of the field.

c. Again, from a study of the base-line system as described in Section I, above, it can be seen that it is necessary to make a horizontal plot of the course of the target, and to do this the instrument must be capable of being accurately oriented and the azimuth of the target read at any desired time. It is also desirable to be able to read angular heights from the battery instrument.

d. Another consideration is the lighting of the graduations for night observing, as the reflected light from the searchlights is not sufficient for this purpose. For training, however, this light is sufficient to illuminate the cross-hairs.

e. Such an instrument has been improvised and used in the antiaircraft exercises at Aberdeen Proving Ground in 1927 and 1928 and at other target practices.

2. *Description. a.* The main body of the instrument consists of the complete A. A. Telescope, Wind and Parallax Computer, model 1920. This instrument meets the requirements of portability, training, and orientation.

b. The instrument (Figure 1) consists of a tripod, base plate with azimuth scale (2), telescope mount, elevating arc and screw (4) and telescope (1).

(1) The tripod is of the standard three-leg, adjustable and folding type.

(2) The base plate is made to clamp to the tripod when oriented, allowing the arms (2) and (3) to move with the telescope. One of these arms is used for traversing either by hand or with the slow-motion device as shown in figure 9. One of the shorter arms (3), with a piece of tin attached, is used for marking a line on the plate to designate a certain azimuth. As used in spotting, the azimuths of the target at the instants of first and last bursts are

marked. One of the other arms has a pointer (2) attached to it to read azimuths from the base plate. The outer rim of the base plate is graduated to ten mils.

(3) The standard used for supporting the telescope is attached to the arms previously described. The telescope is attached to this standard by trunnions and an elevating hand screw mounted on these trunnions works through a worm screw to the elevating rack on the under side of the telescope.

(4) The angular-height pointer is also attached to the trunnions and the scale to the telescope. The pointer is adjustable.

(5) The telescope is a two-power instrument having both 10 and 25-power magnification through two different eyepieces, either of which can be brought into use by a lever on the rear of the telescope.

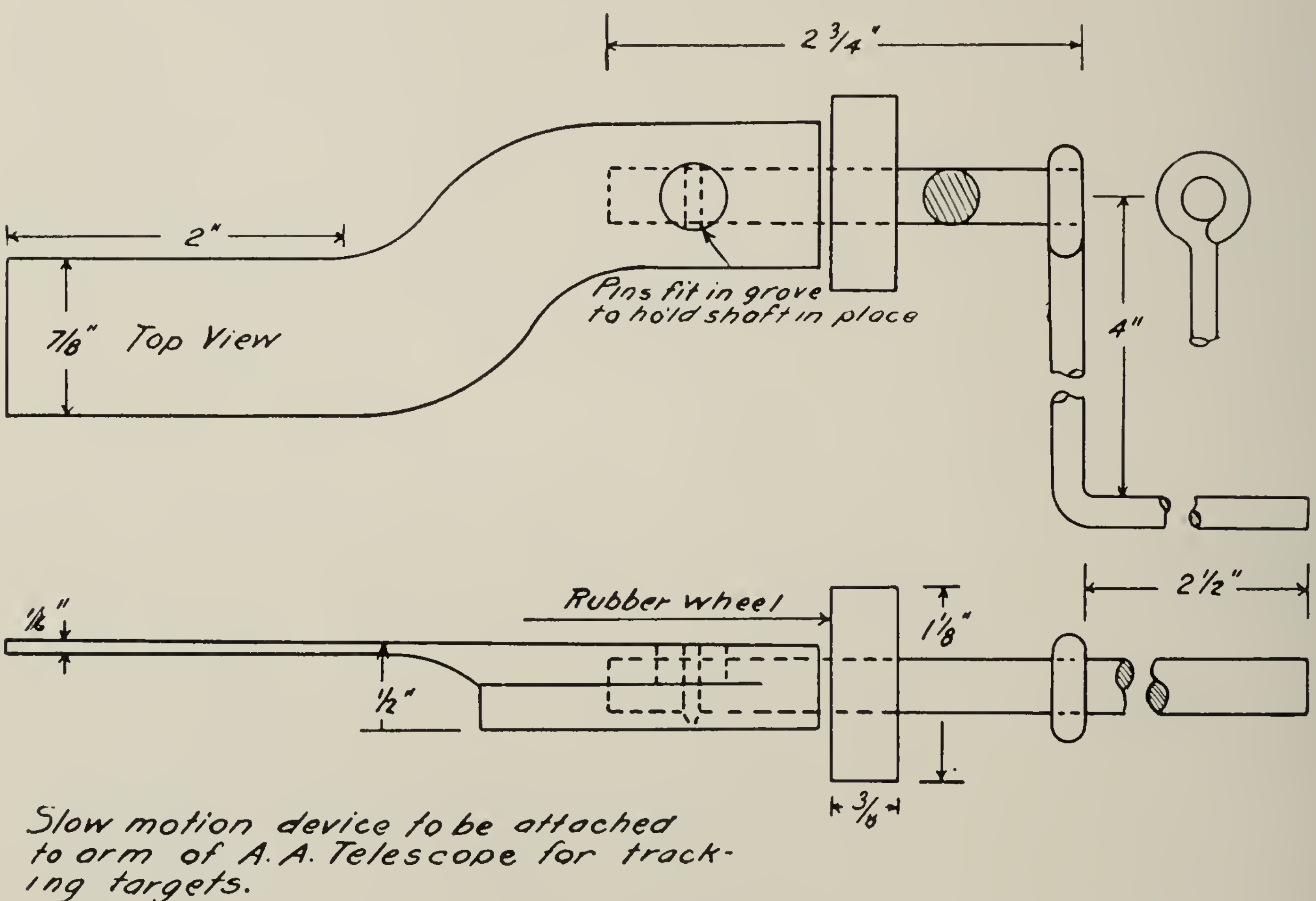

Fig. 9

c. The added equipment consists of cross-bar, with clamp with which to fasten it to the telescope, and a model 1917 gun sight mounted at each end of this bar.

(1) The cross-bar is made of U-section iron or steel, tapered at the ends and having holes bored in the web to lighten it. The center is cut away to fit the telescope and the clamp, consisting of a U-shaped rod with threaded ends, is brought through holes in the top where washers and nuts are screwed on, thus clamping the bar tightly to the telescope.

(2) At each end of the bar is attached a device which may be either of the design as shown in Figure 1 or as shown in Figure 2. In Figure 1 the method used is by means of set screws clamping metal blocks to pins, one pin attached to the gun sight by a band clamp, and running through a hole drilled in the outer block (8). By loosening the set screw in this block the sight can

be moved in the horizontal plane. This outside block is connected to the end of the cross-bar by the same arrangement, so that loosening the inside block's set screw allows the sight to be moved in the vertical plane. These two motions allow the observers to colliminate the two gun sights with the main telescope. The other system of attaching sights is plainly shown in Figure 2 and is believed to be easier made and more satisfactory.

(3) Each sight has graduated cross-hairs on which the least graduation is 5 mils. For the battery observing instrument, the reticules in one of the sights must be turned through 90° so the graduation will read vertical deviations.

(4) The lighting device consisted of two small flashlight cells strapped to the underside of the cross-bar (Figure 1) and connected through a switch (6) to a small flash-light bulb (9) mounted above the gun sight. This bulb is dimmed by painting with black paint but gives sufficient light to illuminate the cross hairs. The target cannot be seen when the light is on but the flash of the bursts are plainly visible.

IV. Synchronizer

1. *Introductory.* *a.* For a visual system of spotting it is necessary that some means be provided for recording the deviations as called by the spotters and synchronizing them so that there is assurance that the three deviations of one burst are the ones observed of that burst.

b. To do this, a special synchronizer was manufactured by Frankford Arsenal and used at the flank station for recording all visual observations for these exercises. The general layout is shown in Figure 10.

2. *Description.* *a.* The instrument (Figure 3) consists of a wooden box about 43″x 13″x 6″ open at the bottom and having two 41-inch slots in the top to allow the paper to pass over the recording space on the top.

b. The rollers are of wood, 3 inches in diameter and about 41 inches long, mounted to the ends of the box with brass bearings. A steel rod runs through each roller to act as a shaft and fits in these brass bearings. Each roller shaft is connected through the ends of the box to a turning handle to allow the rollers to be turned. The forward rolling is done by a small crank (1) which is geared to the upper roller shaft. This reduction gearing allows the roller to be turned slowly and smoothly. The lower roller is also connected to a turning knob (6) on the outside for reversing the motion of the rollers and to wind the paper back on the lower roller.

c. It was found that ordinary paper did not prove satisfactory, as the strain of rolling from one roller to the other caused it to tear and the erasing of figures recorded on it quickly ruined the writing surface, so standard 40-inch tracing cloth was used. Also, it was found necessary to tack a piece of tracing cloth to the top of the box over which the roll of cloth moved, in order to give a better writing surface and to reduce friction. About twenty feet of this cloth were provided and it was found that very rarely was over half of it used, although as many as 120 sets of deviations were recorded. This cloth was attached

to the rollers with thumb tacks and aligned as perfectly as possible to prevent rolling unevenly or toward one edge. Three lines (2, 3, and 4) were drawn down this paper so that the sense of the deviation was recorded by the side of this line on which a given deviation was recorded.

d. This cloth was fastened to one roller, brought through the slot above that roller to the top of the box, across the top about four inches, and down through the second slot to the other roller. In rolling from one roller to the next, about four inches of this cloth moved along the top of the box in such a manner that deviations could be recorded on it with soft pencils as it moved. It might have been better to have had a window for each recorder but it was

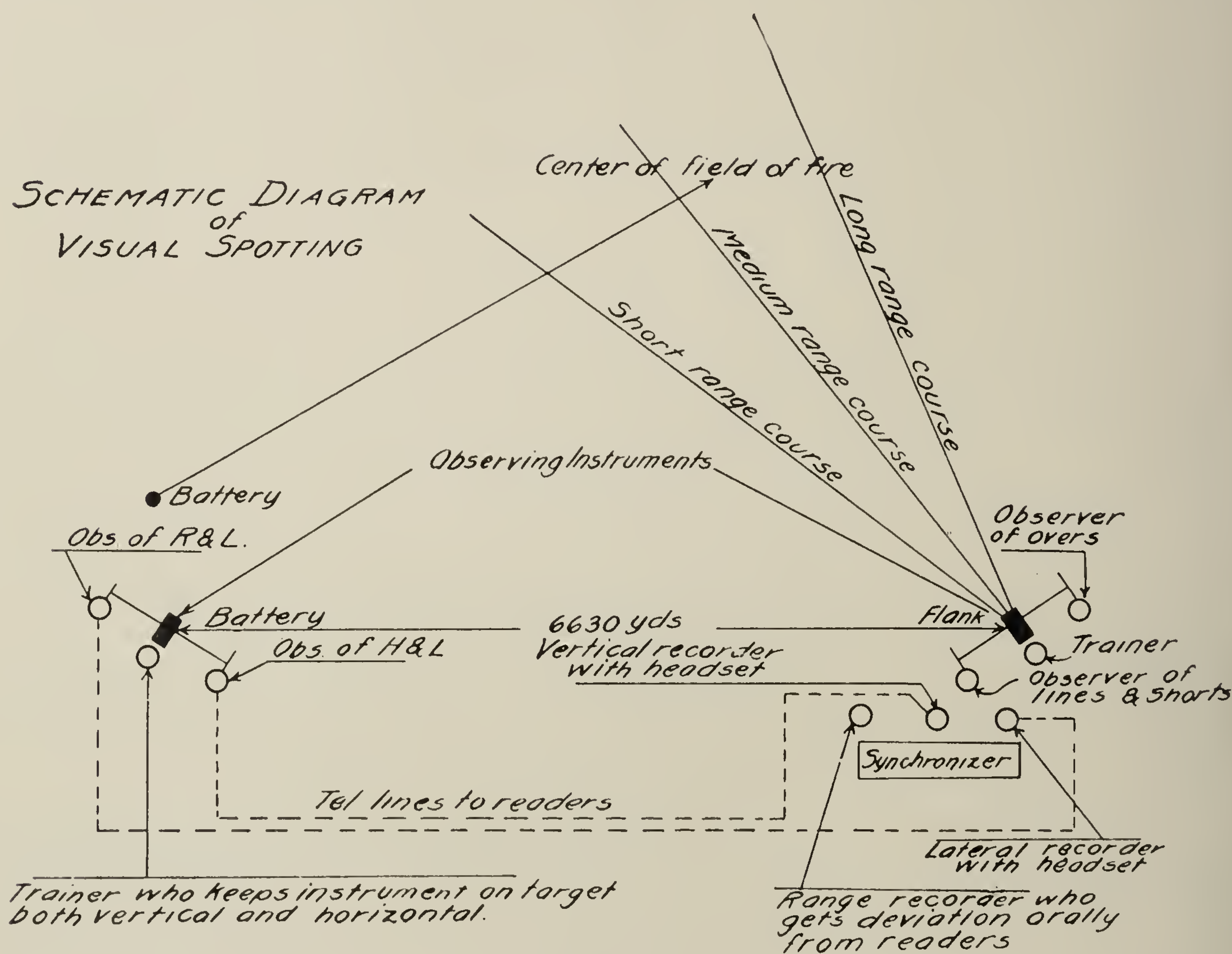

FIG. 10

thought better to place a brass strip (5) along the edge of the recording space and to require the recorders to write as near this brass strip as possible. If the deviations were called at the instant of burst all recorders would receive them and record them at the same instant. Writing close to the brass strip would then assure that the deviations were synchronized.

e. To operate the synchronizer, three recorders are needed: lateral, vertical, and longitudinal. During the exercises, the synchronizer was placed at the flank station and two telephone lines run from the battery observing instrument to the lateral and vertical recorders, who wore headsets. The logitudinal recorder received his deviations orally from the observers at the flank. When the first shot was fired, the flank station was notified and the operator of the synchronizer started turning the crank, causing the recording cloth to move over

the top of the box. As the deviations were received by the recorders they were written on either side of the lines 2, 3, and 4. Any other items of interest later, such as "lost," "over," "target in clouds," etc., was written on the cloth. Also, the course number was recorded.

f. After the practice the cloth was rolled backwards to the beginning and the deviations read off and recorded on the data sheets. Then the figures written on the cloth were erased and the synchronizer was ready for the next practice.

V. Stephens' Xylonite Plotter

1. *Introduction*. *a*. A plotter (Figure 7) was designed, constructed, and submitted by Master Sergeant Stephens, of the Coast Artillery, for test in plotting the position of bursts for antiaircraft firing.

b. This plotter, which is based on proportional parts, is designed to convert mils of deviation at any given slant range, to yards at the scale used for plotting.

c. It was originally designed to use with a straight edge but was found to operate more satisfactorily and faster attached to a Universal Drafting Machine. However, it was used somewhat with only a straight edge and proved very efficient.

2. *Description*. *a*. The plotter was made of xylonite in the form of a rectangle. Edges were made perfectly smooth and at right angles to each other.

b. Any convenient scale could be used for laying off slant ranges the longer way of the plotter. The model used had a scale of 1 inch equal 2000 yards. It is believed that a more convenient scale is 1 inch equals 1000 yards. Thousand-yard lines are drawn across the plotter, and graduations in the center to every 100 yards is convenient. The thousand-yard lines should be numbered.

c. The scale across the plotter must be that decided on for the scale of plotting. One inch equals 50 yards was used for these exercises and this plotter was made to that scale. To lay off the mil deviation lines (2) each mil value in yards at 10,000 yards was laid off from each side edge along the 10,000-yard slant range line and these points connected to the zero slant range line at each edge of the plotter. The 5-mil lines were made heavier to make them stand out. These lines therefore crossed each slant range line at a distance, to the scale of the plotter, of the amount of that deviation in yards at that slant range. Each 5-mil deviation line was numbered at two points to make it easier to pick out.

d. An attachment, taken from the end of a ruler used on the universal drafting machine, was fastened to the end of the plotter so it could be attached rigidly to the head of the drafting machine.

The Battles Around Chattanooga

I. The General Situation

By Major Edward B. Dennis, C. A. C.

General Situation

AFTER about two and one-half years of war, the Northern armies held the general line: South bank of the Potomac River—Allegheny Mountains—Tennessee River to a point just south of the Alabama state line, thence west and south to New Orleans. The country north of this line and east of the Mississippi was definitely under Northern control. The Southern ports were either in possession of Northern troops or blockaded. The main armies of both sides were engaged in Northern Virginia or in Eastern Tennessee.

From January to June, 1863, Northern troops, numbering some 60,000 (at the end of that period) held Murfreesboro, Tennessee, under Major General Rosecrans.

During the same time, Southern troops, approximately 43,000 in all, covered the routes to Chattanooga, under Lieutenant General Bragg.

Northern cavalry was outnumbered by Southern cavalry, which was more active.

On June 23, 1863, the Northern general issued orders for a forward movement toward Chattanooga.

In nine days, during the period June 24-July 3, the Northern troops, without a serious engagement, had so maneuvered as to force the weaker Southern forces to abandon an entrenched camp at Tullahoma and all of Tennessee west of the Tennessee River.

The Southern troops retired to Chattanooga.

On July 4, 1863, on another front, victorious Northern troops were released by the fall of Vicksburg and became available for reinforcements elsewhere.

Chattanooga, which is located on the south bank of the Tennessee River, was vitally important to both sides. The possession of the routes passing through Chattanooga to Knoxville and southward from Chattanooga to Dalton, Georgia, was essential to any advance of the Northern forces to the south and in like manner equally essential to any offensive operation by Southern troops against the north.

On July 25 trains were running to Bridgeport, Alabama, and that town subsequently became the railhead for Northern troops.

Lack of supplies and insufficient communications somewhat retarded the advance of the Northern troops, who camped in the general line Winchester-McMinnville.

On August 16 the Northern troops again began their advance with the object of crossing the Tennessee River below Chattanooga, turning the left of

the Southern forces, intercepting their communications, and capturing Chattanooga from the rear.

By September 4 the Northern troops had crossed the Tennessee River in several places.

On September 8 the Southern army, whose effective strength at this time was estimated as being 20,000, evacuated Chattanooga without any defensive action against the superior Northern forces and concentrated along the east bank of the Chickamauga Creek from Lee and Gordon's Mill to Lafayette.

The Northern general believed the enemy was retreating towards Rome, Georgia.

On September 9 a brigade of Northern troops under General Crittenden took peaceful possession of Chattanooga while the main body advanced up the East Chickamauga Creek and railroad to Ringgold and Dalton.

Meanwhile the Southern forces were concentrating around Lafayette (twenty-five miles southeast of Chattanooga). Reinforcements poured in, including a heavy corps from Lee's army. In a short time Lieutenant General Bragg commanded an army of 92,000 men.

Skirmishing occurred on the 11th, 12th and 13th, and it became evident to the Northern troops that the forces opposed to them were stronger.

On September 17 the Northern troops were attacked in strength and gave ground.

As late as September 18 neither army knew the exact location of the other.

During September 19 and 20 the battle of Chickamauga was fought. On Sunday, September 20, the opening of the battle was delayed until 8:30 A. M. on account of a dense fog. By 4:00 P. M. of the twentieth the Southern forces had gained a decided advantage and the Northern troops started to retire towards Rossville. There was no pursuit.

On September 21 the Northern troops withdrew at night, in good order, to positions in front of Chattanooga. The Southern forces, although victorious on the battlefield, failed to reap the full benefits which an active pursuit would have given them.

The forces engaged on September 19 and 20 were approximately as follows:

Northern: 55,000 to 56,000, all arms (including 10,000 cavalry).

Southern: 61,000 to 71,000, all arms (including 14,000 cavalry).

Losses were estimated as—

Northern: 16,000 men.

Southern: 18,000 men.

The Northern troops were beaten and driven back to Chattanooga and there besieged by the very army they had successfully maneuvered out of that town.

On September 23, 1863, the Northern troops in Chattanooga, whose effective strength was estimated as about 35,000 men, were opposed to Southern forces numbering about 55,000 men.

The cavalry of both sides was located well to the flanks along the Tennessee River.

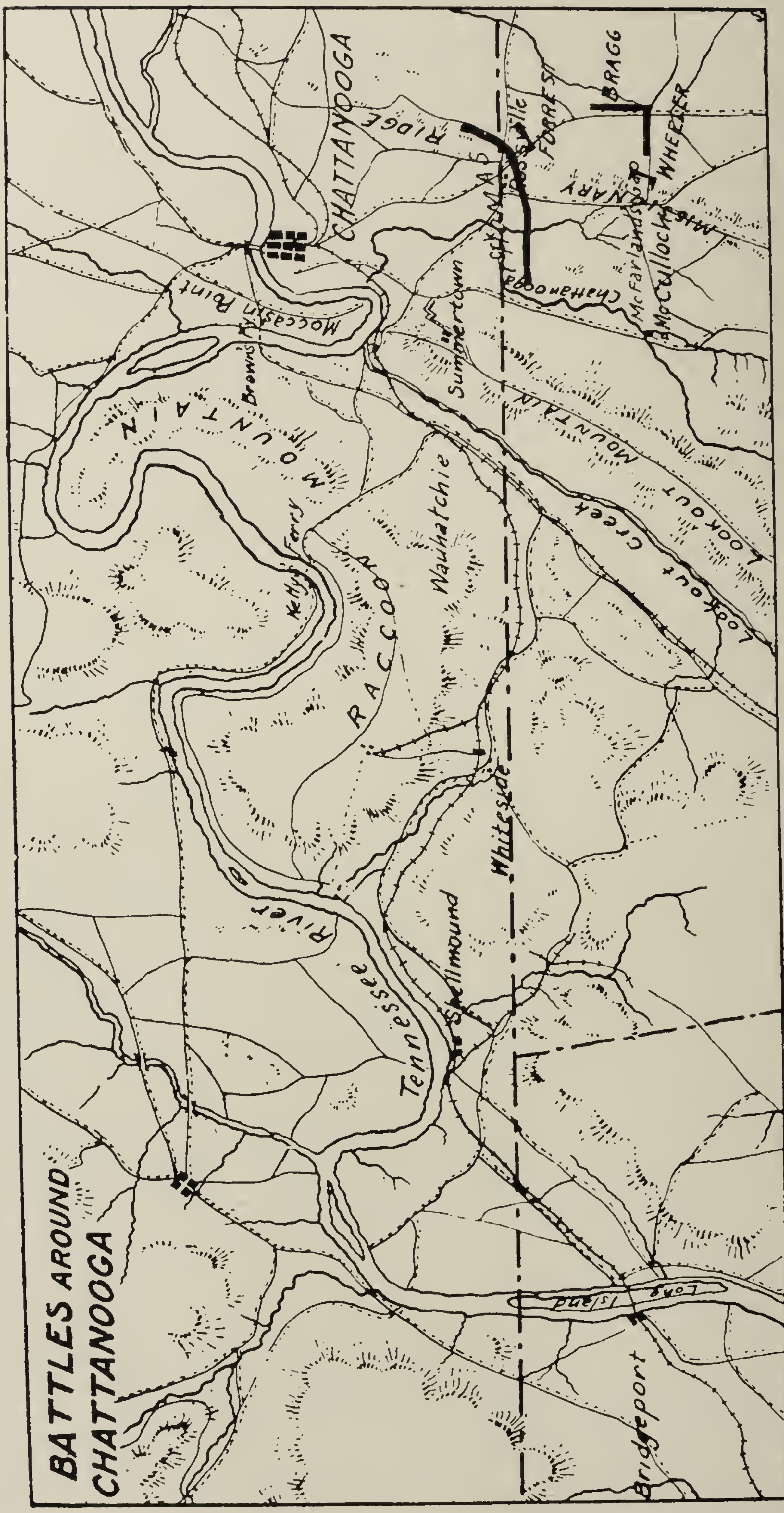
BATTLES AROUND CHATTANOOGA
CHATTANOOGA
Ridge
Moccasin Point
Browns Fy.
MOUNTAIN
Kellys Ferry
RACCOON
Wauhatchie
Summertown
Lookout Creek
LOOKOUT MOUNTAIN
Tennessee River
Shellmound
Whiteside
Long Island
Bridgeport
Rossville
FORREST
BRAGG
WHEELER
McFarlands Gap
McCullochs
Chattanooga

FIG. 1

Special Situation (North)

In their retreat to Chattanooga, the Northern troops made no effort to hold Lookout Mountain, the railroad, or the river below Chattanooga.

The length and condition of the roads made wagon transportation from Bridgeport a precarious means of supply for the beleaguered Northern army. The situation was critical for the Northern forces.

Northern cavalry, holding the north bank of the Tennessee River from Caperton's Ferry to Washington, protected the flanks of the forces in Chattanooga and their line of communications. Crook's division kept watch for fifty miles up the river and McCook's men stood guard at the crossings above and below Bridgeport. Only the main fords could be watched.

Southern cavalry continued superior in strength to Northern cavalry.

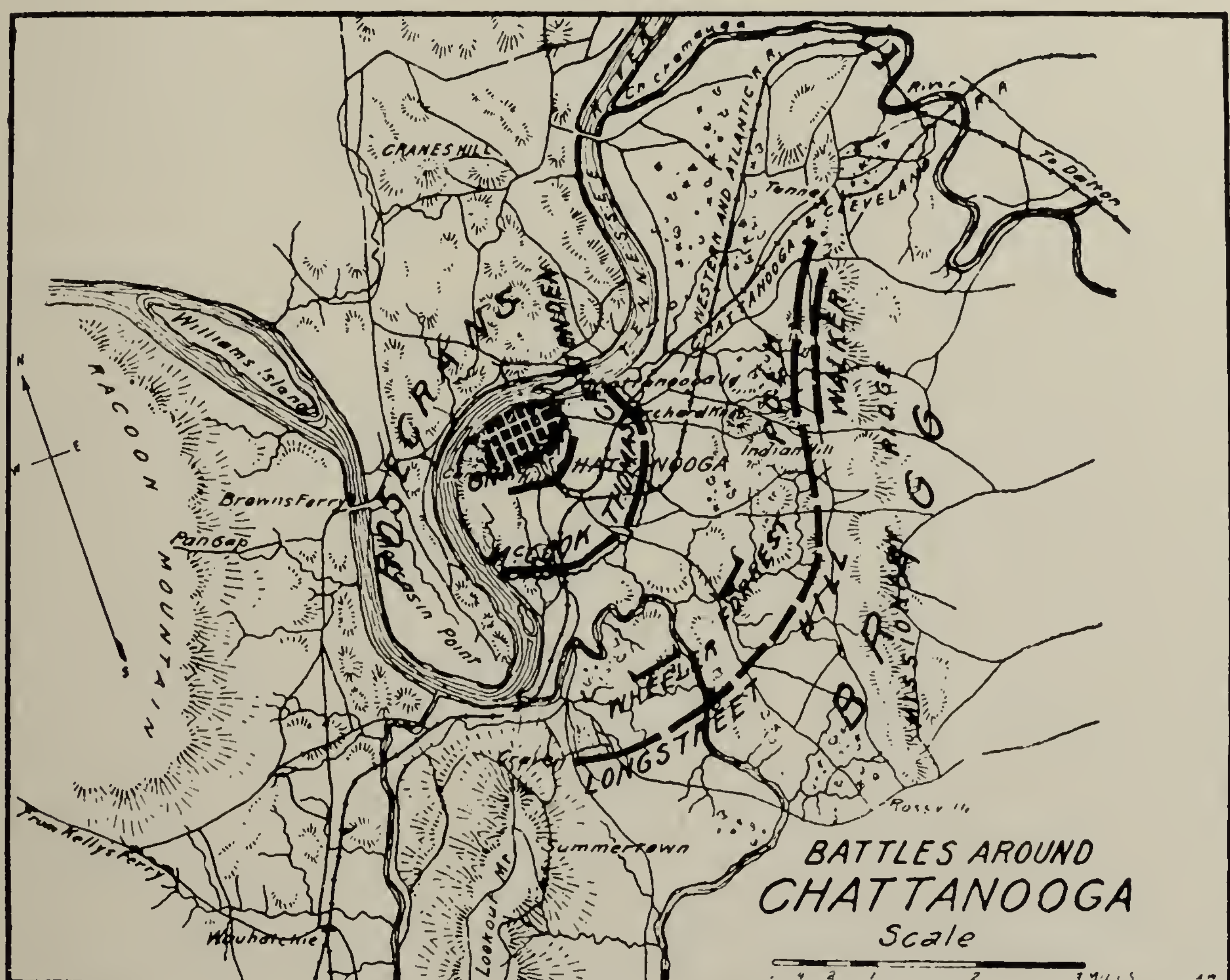

Fig. 2

The Battles Around Chattanooga

After withdrawing from Rossville Gap on the night of September 21, 1863, the Northern forces (Army of the Cumberland) formed in front of Chattanooga from the river above the town to the bend in the river below.[1]

Of the Northern army some 35,000 men now occupied as salients the strong unfinished works left by the Southern troops and before noon of the twenty-second had them connected by rifle pits.[2] The Southern forces followed their

[1] 50 Rebellion Records 196.
[2] 50 RR 197, 706; 53 RR 696, 706.

enemy northward on the twenty-second and twenty-third and occupied positions in front of the Northern army.[3]

The line held by the Southern troops extended along the western base of Missionary Ridge from the railway tunnel to a point about two miles farther south than Orchard Knob, thence westerly across Chattanooga Valley to Lookout Mountain.[4] The commander of the Southern troops, Lieutenant General Bragg, contented himself with investing the Northern army with the foregoing incomplete line.[5]

To the Southern cavalry, under command of Major General Joseph Wheeler, was given the task of cutting the communications of the Northern army with its depot in Bridgeport on the northern side of the river and the destruction of the railway beyond that point.[6] The Northern cavalry held the northern bank of the Tennessee River from Washington to Caperton's Ferry (near Stevenson) to protect the trains passing from Bridgeport to Chattanooga.[7]

On September 30 General Wheeler, with some 4500 of his Southern cavalry and 12 guns, crossed the river near Washington and made for the Northern line of communications.[8] As soon as the fact became known, General Rosecrans gave orders to General Crook to pursue and to Colonel McCook to march from Bridgeport to Anderson's Crossroads.[9]

On October 2 Wheeler, moving via Pikeville, intercepted and partially destroyed a train of ammunition and supply wagons near Anderson's Crossroads.[10]

Colonel McCook, upon the receipt of his orders, gave instructions to his second brigade to join him at Jasper.[11] He then started with the First Wisconsin, the Second and Fourth Indiana Regiments, and a section of artillery.[12] Rain delayed the marching.[13]

On October 2 McCook, as he approached Anderson's, saw smoke and, later burning wagons.[14] He advanced, encountered a portion of Wheeler's troopers, and then charged with the First Wisconsin and Second Indiana Regiments and drove the enemy past the burning wagons and upon the main body, which was one mile north of the crossroads, in line of battle. These two regiments dislodged the enemy from successive positions and pursued for two miles driving the enemy across the Sequatchie Valley.[15] In this action the saber was freely used.[16]

On October 3 the pursuit was continued to the top of the mountain beyond Dunlap, where the rear guard was again attacked with successful result.[17]

Altogether, McCook captured twelve commissioned officers and ninety-three enlisted men, and killed seven officers and several enlisted men.[18] Three hundred mules were recaptured and some of the wagons were saved.[19] The enemy

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[3] 53 RR 681, 689, 692.
[4] 53 RR 697.
[5] 53 RR 706.
[6] 51 RR 664; 53 RR 695, 711.
[7] 51 RR 664, 669.
[8] 50 RR 205; 51 RR 664; 52 RR 953, 956; 53 RR 26, 109, 134, 734.
[9] 50 RR 205; 51 RR 664; 52 RR 32; 53 RR 21.
[10] 53 RR 31, 38.
[11] 51 RR 675, 682.
[12] 51 RR 675, 689.
[13] 51 RR 675; 53 RR 9.
[14] 51 RR 675, 683.
[15] 51 RR 675; 53 RR 61, 68, 69, 85.
[16] 51 RR 697; 53 RR 69.
[17] 51 RR 696; 53 RR 70.
[18] 51 RR 675, 696.
[19] 51 RR 675, 697.

destroyed three hundred wagons and a large number of mules.[20]

The force had previously divided, Wharton's division having been sent to McMinnville by a detour to the north.[21] In the meantime General Crook's command had ascended the mountain south of Smith's Crossroads and was in rapid pursuit toward McMinnville.[22] On October 3 he overtook Wharton's rear guard descending the Cumberland Mountains. It was late in the day and they escaped.[23] On the fourth the pursuit was resumed but Wharton's men captured McMinnville and the stores at that station before Crook's arrival. A large amount of property was destroyed by the Southern raiders. The Southern troops marched rapidly on Murfreesboro.[24]

Colonel Crook again encountered the rear guard on the Murfreesboro road. The Second Kentucky charged, pursuing through the Southern lines for about five miles, which compelled the main column to turn and fight. Darkness stopped the fighting.[25]

Squads were sent out by the Southern troops to cut the telegraph wires between Murfreesboro and Nashville.[26] Murfreesboro was saved from pillage by the arrival of the Northern troops.[27]

On October 6 General Mitchell, the senior cavalry commander, arrived at Murfreesboro and on the following night the whole command bivouacked seven miles from Shelbyville.[28] On the seventh it was learned that Wheeler had divided his command into three columns, directed respectively to Wartrace, Shelbyville, and Unionville.[29]

General Mitchell sent McCook to Unionville and Crook to Farmington.[30] The infantry drove the Southern cavalry under Davidson to Farmington. Colonel Miller led a charge through the Southern lines and broke through, capturing some artillery.[31]

On the eighth the Northern troops followed the Southern cavalry, marching on Pulaski.[32] On the ninth they passed through Pulaski to Rogerville, where they learned that the Southern troops had succeeded in getting across the river with a loss of seventy men belonging to their rear guard.[33] On the tenth information was received that a second force of 2000 Southern cavalry under General Roddey, with four pieces of artillery, having failed to make a junction with Wheeler, was marching for the fords of the Tennessee River.[34]

Roddey, learning that Wheeler had been severely repulsed at Farmington and was retreating, counter-marched, starting back at daylight the eleventh or twelfth for Athens, Alabama.[35]

General Lee, with a third body of Southern cavalry, who had been ordered to cross the Tennessee River and cooperate with Wheeler and Roddey, deemed it too hazardous under the circumstances and remained south of the river.[36]

[20] 53 RR 37, 38.
[21] 50 RR 206; 53 RR 43, 49, 60, 156.
[22] 51 RR 677; 53 RR 61.
[23] 51 RR 664, 676.
[24] 50 RR 107; 53 RR 78, 79, 84, 85, 174, 217.
[25] 51 RR 686.
[26] 53 RR 79.
[27] 53 RR 135, 160, 217.
[28] 51 RR 667, 669, 679.
[29] 51 RR 669.
[30] 51 RR 670.
[31] 51 RR 607, 666, 670; 53 RR 370, 757.
[32] 51 RR 670, 677.
[33] 51 RR 670, 677, 680.
[34] 51 RR 671, 680, 729.
[35] 51 RR 665, 678, 729.
[36] 51 RR 665; 53 RR 21.

Meanwhile the condition of the beleagued army became serious. The destruction of hundreds of wagons and animals by Wheeler was almost fatal to the Northern army. Each trip to Bridgeport was made with fewer wagons and lighter loads. This resulted in a like reduction in the rations issued.[37] Early in October rains set in and soon the roads became almost impassable.[38]

By examining the map it will be seen that the Tennessee River flows west for a mile or two at Chattanooga, then bends and flows south for about two miles until it strikes the rock of Lookout Mountain, by which it is turned around to the west again. Then it flows north and makes a deep bend around the northern end of Raccoon Mountain. With two or three more windings around the mountain spurs it passes Bridgeport. Across the narrow tongue of land called Moccassin Point was Brown's Ferry, which was located about two miles from Chattanooga and at the eastern end of the route that led over Raccoon Mountain to Kelly's Ferry. By this route Kelly's Ferry was only eight miles from Chattanooga; by the river it was twenty-odd miles.

A plan was devised by General W. F. Smith, Chief Engineer of the Northern army, to throw a pontoon bridge across the Tennessee at Brown's Ferry, get control of the country south of the river and west of Lookout Mountain, and establish a line of communication by wagon road from Chattanooga to Kelly's Ferry and by boat from the ferry to Bridgeport.[39]

On October 16 an order was issued which relieved General Rosecrans from the command of the Northern forces at Chattanooga and placed General Thomas in his place. This order also combined the departments of the Ohio, the Cumberland, and the Tennessee under the sole command of General Grant.[40]

II. Shortening the Line of Communications

By Major Edgar B. Colladay, C. A. C.

Pursuant to G. O. 337, W. D., October 16, 1863, delivered to General Grant at Louisville, Kentucky, by the Secretary of War on October 18, General Grant assumed command of all forces in the western theater of operations and General Thomas replaced General Rosecrans at Chattanooga.[41]

During the following week there was little or no fighting in the vicinity of Chattanooga. Light artillery fire from Confederate batteries did little harm. On October 23, 1863, General Thomas ordered General Hooker to concentrate part of his forces, the XI Corps and the 1st Division of the XII Corps, at Bridgeport preparatory to moving on Chattanooga.[42]

General Grant, on his arrival in Chattanooga on October 23, approved a plan (which had been devised by the beleaguered troops) for shortening the communications of the Federal troops. This plan was as follows: General Hooker, leaving sufficient guard for the railroad to Nashville, was to move from Bridgeport by way of Whiteside's to Wauhatchie. General Palmer was

[37] 50 RR 214, 216, 218, 220; 53 RR 14, 36, 65.
[38] 53 RR 9.
[39] 50 RR 216.
[40] 53 RR 478, 485.
[41] 55 RR 11, 27.
[42] 54 RR 42.

to cross the river near Whiteside's to protect General Hooker's line of communications. A force under General William P. Smith, Chief Engineer of the Army of the Cumberland, was to cross at Brown's Ferry to seize the hills covering the Brown's Ferry road and thus secure the wagon route to Kelly's Ferry. At this point supplies could be delivered by boat from Bridgeport. General Smith had prepared about fifty pontoons and two large flat boats to be used in transporting troops from Chattanooga to Brown's Ferry by the river for the initial crossing.[43]

The south side of the river from Lookout Mountain to a point five miles down the river was picketted with two regiments of General Law's brigade to prevent the passage of Federal wagon trains along the road on the north side of the river. The rest of General Law's brigade was in support.[44]

At 3:00 A. M., October 27, 1863, a few hours before General Hooker marched from Bridgeport, about 1500 men under General Hazen embarked in the pontoons and flat boats provided by General Smith. They floated down the river close to the north shore. Due to darkness and fog they were not discovered by the Confederate pickets until they were about to land on the opposite shore at Brown's Ferry. The Confederate pickets opened fire. The Federals returned the fire and the Confederate pickets withdrew. A landing was effected and the crest of a line of hills about 500 yards from the river secured before the Confederates could organize any resistance. The Confederates shortly attacked and forced the first landing wave part way back to the river. The second wave under Col. Langden had landed by this time and reinforced the Federal line.[45]

The Confederates were now forced back and they withdrew to the left. General Law's supporting troops took up a defensive position across the valley covering the withdrawal of all Confederate river pickets. General Law then withdrew his entire force toward Lookout Creek, to the west of which he took up a defensive position.[46]

In the meantime the rest of General Smith's command, which had marched from Chattanooga across Moccasin Point, were ferried across the river at Brown's Ferry. In less than one hour 5000 men and two pieces of artillery had crossed. During part of this movement the Confederates placed an ineffective artillery fire on the Federal troops. The pontoon bridge was placed in position and completed before noon the same day. The Federals then took up a defensive position covering the bridgehead.[47]

General Hooker, pursuant to orders from the Department, marched early October 27 via Whitesides to Wauhatchie, with General Howard's Corps in the advance and General Geary's division in the rear. The command gained contact with General Law's troops in the vicinity of Wauhatchie in the afternoon of October 28 and drove them back. General Law then withdrew across Lookout Creek. General Hooker's Headquarters and General Howard's Corps went into camp one mile south of Brown's Ferry and General Geary's Division camped in the vicinity of Wauhatchie.[48]

[43] 54 RR 78, 224; 55 RR 27.
[44] 54 RR 216, 224.
[45] 54 RR 78, 82-84, 86-87.
[46] 54 RR 88-89, 224-226.
[47] 54 RR 78, 224-226; 55 RR 28.
[48] 54 RR 48, 92, 101, 102, 224, 225.

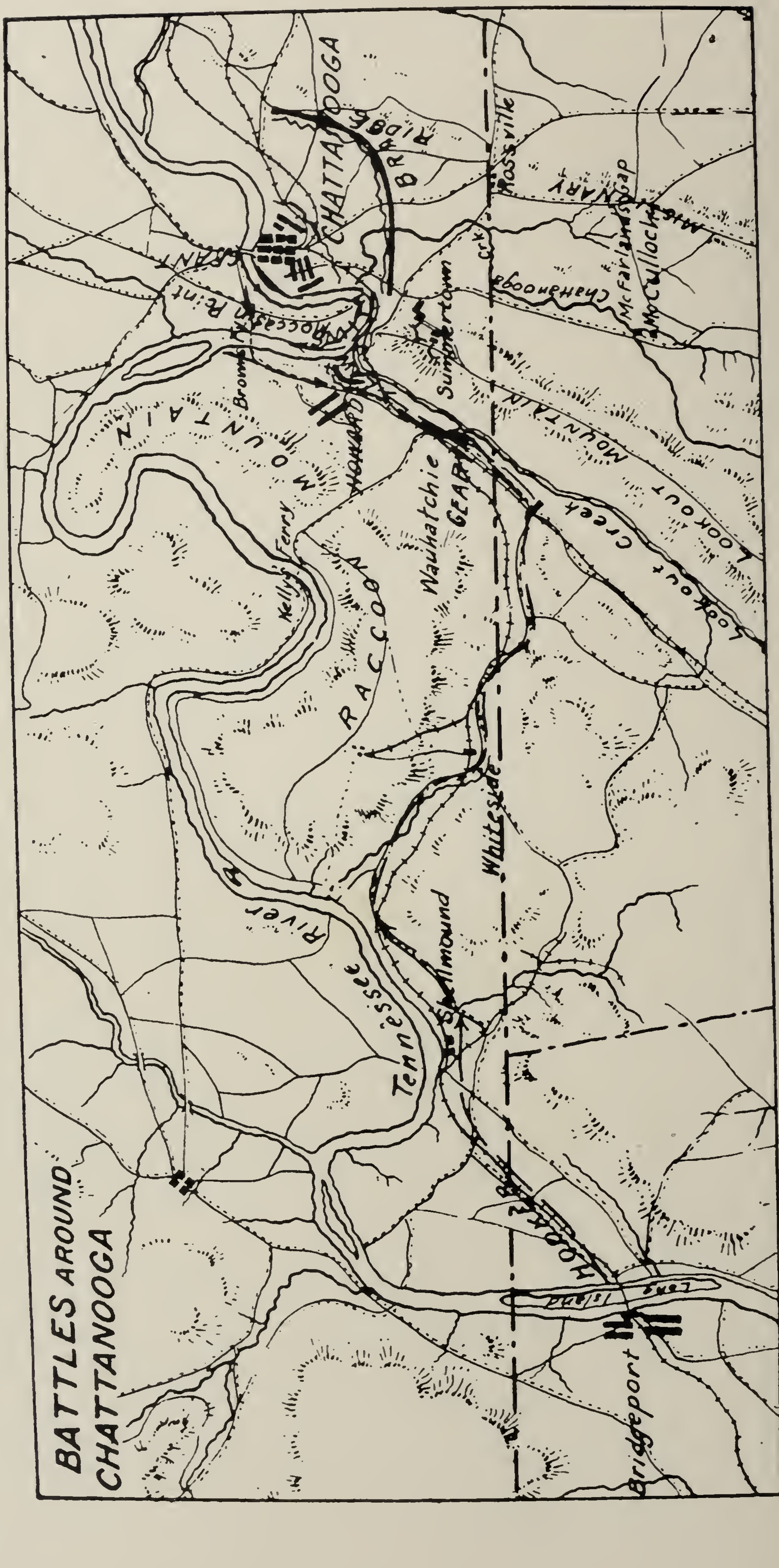
BATTLES AROUND CHATTANOOGA
CHATTANOOGA
GRANT
Moccasin Point
Tennessee River
RACCOON
MOUNTAIN
Kelly's Ferry
Wauhatchie
GEARY
HOWARD
Summertown
Whiteside
Shellmound
Bridgeport
Long Island
HOOKER
Rossville
MISSIONARY RIDGE
McFarlands Gap
McCulloch
Chattanooga Cr.
Lookout Creek
LOOKOUT MOUNTAIN

Fig. 3

During the latter part of the march and after General Law's command had withdrawn, the Confederate batteries on Lookout Mountain fired on General Hooker's column but with little or no effect.[49]

At the same time Generals Bragg and Longstreet, from the top of Lookout Mountain, watched the columns march by and go into bivouac. As soon as General Geary's command had gone into bivouac General Longstreet ordered General Law's brigade reinforced by three brigades of General Jenkin's command to occupy, under cover of darkness, the high ground west of Lookout Creek and prevent assistance going to General Geary. One brigade was to attack General Geary's command and one brigade held in reserve on General Law's left. In addition, if possible, General Jenkins was to drive the main body of the Federals back across the Tennessee river.[50]

That night General Bragg approved the plan and made available one other division for the operation, but General Longstreet says the division could not be used as it could not have got to the west side of Lookout Creek before daylight, for the mountain roads were very difficult and the success of the plan depended on a surprise night attack. General Law was therefore given two brigades to hold his position while Jenkins, with the other two, one in reserve, made the main attack on General Geary.[51]

Due to the condition of the roads the Confederates were unable to launch the attack before midnight. It was therefore too late to make any demonstration against the Federal main body. The Confederates had no artillery with Generals Jenkin's and Law's troops and without it they had no desire to leave the command west of Lookout Creek exposed to Federal artillery. General Longstreet says he desired only to inflict such damage against Geary's command as was possible in a night attack and withdraw before daylight.

General Geary's command reached Wauhatchie about 4:30 P. M., October 28, and, knowing they were observed by the Confederates on Lookout Mountain, went into bivouac prepared for all contingencies.[52] General Geary, anticipating an attack, made his strongest dispositions on his south and most exposed flank, expecting the attack to come from that direction. Later he learned that General Longstreet's command was at the foot of Lookout Mountain. He then made provision to repel an attack from the direction of Lookout Mountain and the bridge over Lookout Creek.[53]

About midnight General Jenkins's Brigade, under Colonel Bratton, attacked General Geary from the east.[54] Upon the first firing at the outposts General Geary formed his lines so as to command the railroad and approaches to the right and left. The left of his line was just west of the Kelly's Ferry road and running perpendicular to the railroad. The right of his line was formed at right angles to his center, west of and parallel to the railroad.[55] The Confederates attacked General Geary's left. After a half hour of severe fighting the attack temporarily stopped. The Confederates then prepared to envelop both flanks of the Federal force.[56]

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[49] 54 RR 57, 97, 105.
[50] 54 RR 97, 105, 217, 218, 225.
[51] 54 RR 223.
[52] 54 RR 115.
[53] 54 RR 113.
[54] 54 RR 231
[55] 54 RR 113, 114.
[56] 54 RR 231, 232.

About 3:00 A. M., October 29, as General Geary's ammunition was about gone, General Law's right was driven back by General Howard's Corps. This forced General Law to withdraw. General Geary was getting ready to use the bayonet, and Colonel Bratton says he was getting on very well when General Law's retirement forced him to withdraw. The Confederate command then withdrew east of Lookout Creek.[57]

When General Hooker heard the firing at Wauhatchie he, at 1:00 A. M., October 29, ordered General Schurz's Division of General Howard's Corps to proceed at once to the aid of General Geary. During the march the right of General Law's forces surprised General Hooker by opening fire on General

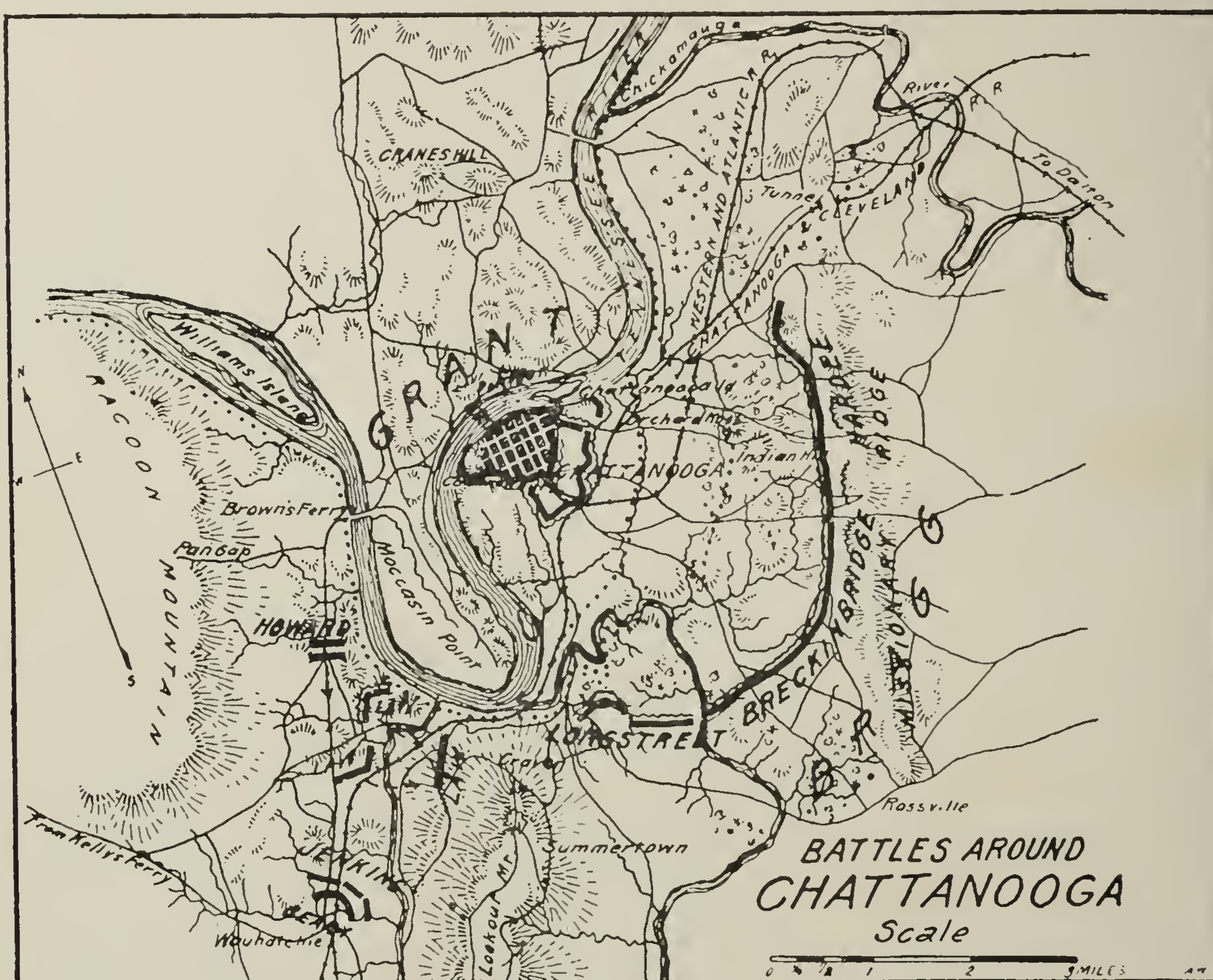

Fig. 4

Schurz's division. General Hooker then ordered one of Schurz's brigades and General Steinwehr's division to drive the enemy back. This surprise resulted in conflicting orders and misunderstanding, the effect of which was that reinforcements did not reach General Geary until after 5:00 A. M., long after the fight. However, this engagement with General Howard's Corps caused General Law to withdraw, which incidently aided General Geary.[58]

General Palmer's command, under General Cruft, crossed the river at Shellmound and his command, less one brigade at Shellmound, joined General Hooker's command on October 31, 1863.[59]

These maneuvers definitely forced the Confederates east of Lookout Creek and gave the Federals control of the valley and country to the west. The Federals now had open to them two routes of supply from Bridgeport, one by

[57]54 RR 115, 218, 228, 232.
[58]54 RR 94-95, 98, 101, 103, 105, 210-211, 228.
[59]54 RR 82.

water to Kelly's Ferry, thence overland via Brown's Ferry to Chattanooga, a distance of only eight miles by wagon road; the other by wagon road via Whitesides, Wauhatchie, and Brown's Ferry, a distance of twenty-eight miles.[60]

General Longstreet withdrew part of General Law's command on October 25 before the crossing was effected at Brown's Ferry. General Law then had an insufficient force available to prevent the Federal forces from crossing.[61]

General Hooker was advised by General Hazen that his position on the night of October 27 invited attack and was poor for defense.[62]

Shortly after these operations Bragg detached Longstreet with about 20,000 men to operate against Burnside at Knoxville. This detachment reduced Bragg's army to about 35,000 men, while Hooker's and Sherman's arrivals prior to the Battle of Missionary Ridge brought Grant's forces up to about 65,000 men.

III. Operation Preliminary to Battle of Missionary Ridge

By Major Roger B. Colton, C. A. C.

On November 23 Grant ordered Thomas with his Chattanooga troops and with Howard's division to attack Bragg. Thomas attacked, drove in Bragg's outposts, securing Orchard Knob and altogether advancing the Union line about a mile and a half in front of Bragg's Center.

Thomas's attack was ordered as a result of a report by a Confederate deserter that Bragg was withdrawing, whereas actually Bragg was sending reinforcements, under General Cleburne, to Longstreet. As a result of the attack most of Cleburne's troops were recalled and placed in general reserve.

After many delays Sherman, coming from Vicksburg, whence he had started on September 22, crossed the river at Bridgeport and Brown's Ferry on pontoon bridges between the twentieth and twenty-third of November, and by midnight November 23 was in position opposite the mouth of the Chicamauga Creek ready to cross with almost 18,000 men.

The pontoons were assembled in a creek valley up-stream and at midnight were floated down stream, carrying a brigade of men under Smith. This brigade landed both sides of the mouth of the Chicamauga and captured or drove off the Confederate pickets and established a bridgehead.

By daylight Sherman had ferried across 8000 men and by noon he had put across a bridge 1350 feet long.

By 1:00 P. M. he had three of his four divisions across and he had marched in three columns on what he supposed to be the northern end of Missionary Ridge but what was really a small detached hill mass. By 3:30 P. M. he was in possession of the northwestern hill of this hill mass, his advance having been opposed only by pickets.

During the morning of November 24 Bragg learned of Sherman's crossing and sent Cleburne to the Confederate right. A small part of these troops seized the hills in front of Sherman at about the time that Sherman got the north-

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[60] 55 RR 28.
[61] 54 RR 224.
[62] 54 RR 72.

western hill. Sherman made no attempt to drive them off. They were reinforced by other troops and were never dislodged.

Battle of Lookout Mountain

General Stevenson held the Confederate line from Chattanooga Creek to Johnson's Crook, about 30 miles, with some 8500 men. The line from Chattanooga Creek to the Summertown Road was held by two brigades of about 3000 men total strength, leaving about 5500 men for the defense of the mountain proper. The troops on the mountain were disposed in part on the plateau and in part on the northern and northwestern slopes of the mountain. The plateau was held with about 2900 men and the northern slopes with about 2600 men. In the vicinity of the Craven House was General Jackson with Moore's and Walthall's brigades.

The forces on the mountain bivouaced near its northern tip. The infantry on the cliff picketted the cliff as far south as Nickajack, while a small amount of attached cavalry (about 150) men picketted the line from Nickajack to Johnson's Creek.

Moore's brigade and Walthall's brigade picketted the line from the Summertown Road along the turnpike to the bridge near the mouth of Lookout Creek, thence south a short distance beyond the railroad bridge, then directly up the mountain slope. Walthall's command bivouaced on the northwestern slope of the mountain, Moore's command near the Craven House.

The Confederate defenses of the mountain consisted of a partially completed line from Lookout Point to the mouth of Chattanooga Creek together with older breast works enclosing the northern nose of the mountain. Walthall held some of the older works on the west side of the mountain paralleling Lookout Creek about one-half mile from the Craven House. His works were dominated by the ledge that extends around the mountain at the foot of the cliff.

Floods and Confederate rafts broke Grant's pontoon bridges on November 23 and left him with 9700 men along Lookout Creek. On the night of November 23 he ordered Hooker, with this mixed command of 9700 men, to attack Lookout Mountain on the morning of November 24.

Starting early in the morning Hooker sent Geary, with 3824 men, south along Lookout Creek to a point about three miles from its mouth where they bridged the creek and effected a crossing without opposition. On crossing the creek they marched straight up the mountain side to the cliff at the crest and then marched north in line of battle with their right on the cliff at the crest and their left on Lookout Creek.

In the meantime, Cruft with about 1600 men established a bridgehead in the vicinity of the railroad bridge over Lookout Creek about a mile south of its mouth. Osterhaus formed in rear of Cruft and by 10:30 A. M. had passed through Cruft and formed line of battle facing east with his right near the railroad bridge.

There was a heavy, though shifting fog over the mountain all day, so the Confederates lost much, if not all, of the advantage of their observation.

Early in the morning Walthall manned his defenses on the west slope of the mountain. When his pickets were attacked he reenforced them, leaving him less than 1000 men in his defenses. Confederate information of the Federal attack was very indefinite but by 10:30 A. M. the Confederates realized that they would soon have to meet a heavy attack and since early morning they had known that the attack was impending.

Geary continued his march down the mountain and at about 10:30 A. M. began to drive in the Confederate pickets on Walthall's left flank. Geary's right was just under the cliff on the flats and advanced rapidly. By the time

FIG. 5

his center had hit Walthall's left his right was already in Walthall's rear. By 11:00 A. M., Walthall was the focus of the advance of 9600 men and was practically surrounded.

Walthall managed to escape with about 400 men to the vicinity of the Craven House, hotly pursued by Geary. The remainder of his men were killed, wounded, or captured. When Walthall arrived at the Craven House at about 12:30 P. M., Moore manned the defenses thereat.

By this time the Federal forces had already arrived at the Craven House. Moore was driven back but managed to put up some resistance until about 1:00 P. M., when Pettus with about 1400 men arrived from the plateau. The Confederate forces engaged now numbered about 2800 men, with about 1800 in reserve on the plateau not engaged. The Union forces were all on or in support of their front line except Cruft's 1600 men who were still in the valley,

but the brunt of the fighting was borne by Walthall (now reduced to 400 men), Moore (about 1200 men), and Pettus (about 1400 men) on the Confederate side, and Geary with 3600 men on the Union side, all engaged close to the Craven House. At this time Geary was definitely stopped a few hundred yards east of the Craven House and never advanced further during the day, although at just about the time he was stopped his left was reinforced and extended by Osterhaus with several thousand men. During the afternoon Hooker was further reinforced by Carlin's brigade.

Osterhaus began his advance when Geary was close on Walthall's right at 11:00 A. M. and extended Geary's line toward Mocassin Point by about 1:00 P. M., engaging Moore's pickets and the right flank of his main body.

The Federal forces now entrenched their line and made no further effort to advance. Bragg sent up Holtzclaw with a brigade (Clayton's) during the afternoon and at 2:30 P. M. ordered Stevenson to withdraw from the mountain. Holtzclaw took over the lines and covered the withdrawal, withdrawing himself shortly after midnight.

IV. The Battle of Missionary Ridge

By Major Franklin Babcock, I. G. D.

During the night of November 24-25, General Bragg withdrew all the Confederate troops from Lookout Mountain and Chattanooga Valley to Missionary Ridge, where on the morning of the twenty-fifth his new line extended from the Chickamauga River on the north to Rossville Gap on the south, a distance of about six miles.[63] Lieutenant General Hardee had command of the right (north) wing and General Breckinridge of the left (south) wing.[64]

In General Grant's army, General Sherman's troops were just south of the Chickamauga River, with the Tennessee River at their back; General Thomas was in the center, just east of the city of Chattanooga; and General Hooker was on the Union right flank just above the northern shoulder of Lookout Mountain, with Chattanooga Creek between him and Missionary Ridge.[65]

Grant placed his headquarters on Orchard Knob, where he had good observation of the field of battle.[66] His orders for the attack on the morning of the twenty-fifth directed Sherman to advance against the Confederate right wing at daylight and Hooker to move at daylight in an endeavor to intercept the Confederate withdrawal from Lookout Mountain and Chattanooga Valley, provided the troops had not already effected the movement, and then to advance directly to the pass at Rossville Gap and operate against the left and rear of Bragg's army on Missionary Ridge. Thomas was not to attack until Hooker had reached Rossville Gap.[67]

Sherman moved forward at sunrise and, after severe skirmishing, assaulted in two lines at about 10:30 A. M. with a strong attack on Tunnel Hill, defended by the division under General Cleburne.[68] This assault was repulsed at close

[63]55 RR 34, 664, 748.
[64]55 RR 664, 665.
[65]55 RR 24, 33, 664.
[66]55 RR 34.
[67]55 RR 96, 317, 574.
[68]55 RR 575, 665, 749.

range by the Confederates in their breastworks on the hill side. Reinforcements were sent from Thomas's command to support Sherman, giving him six divisions, but repeated and stubborn (but piecemeal) frontal assaults up to 3:00 P. M. were without success because of the strength of the Confederate position, Cleburne's excellent dispositions, and skillful coordination of all elements of defense— *i. e.*, occupation of proper tactical localities, emplacement of artillery, arrangements for mutual support and use of counter attack.[69]

In the meantime, Hooker having been delayed by a Confederate detachment, had not arrived at Rossville with his command to attack the left and flank of

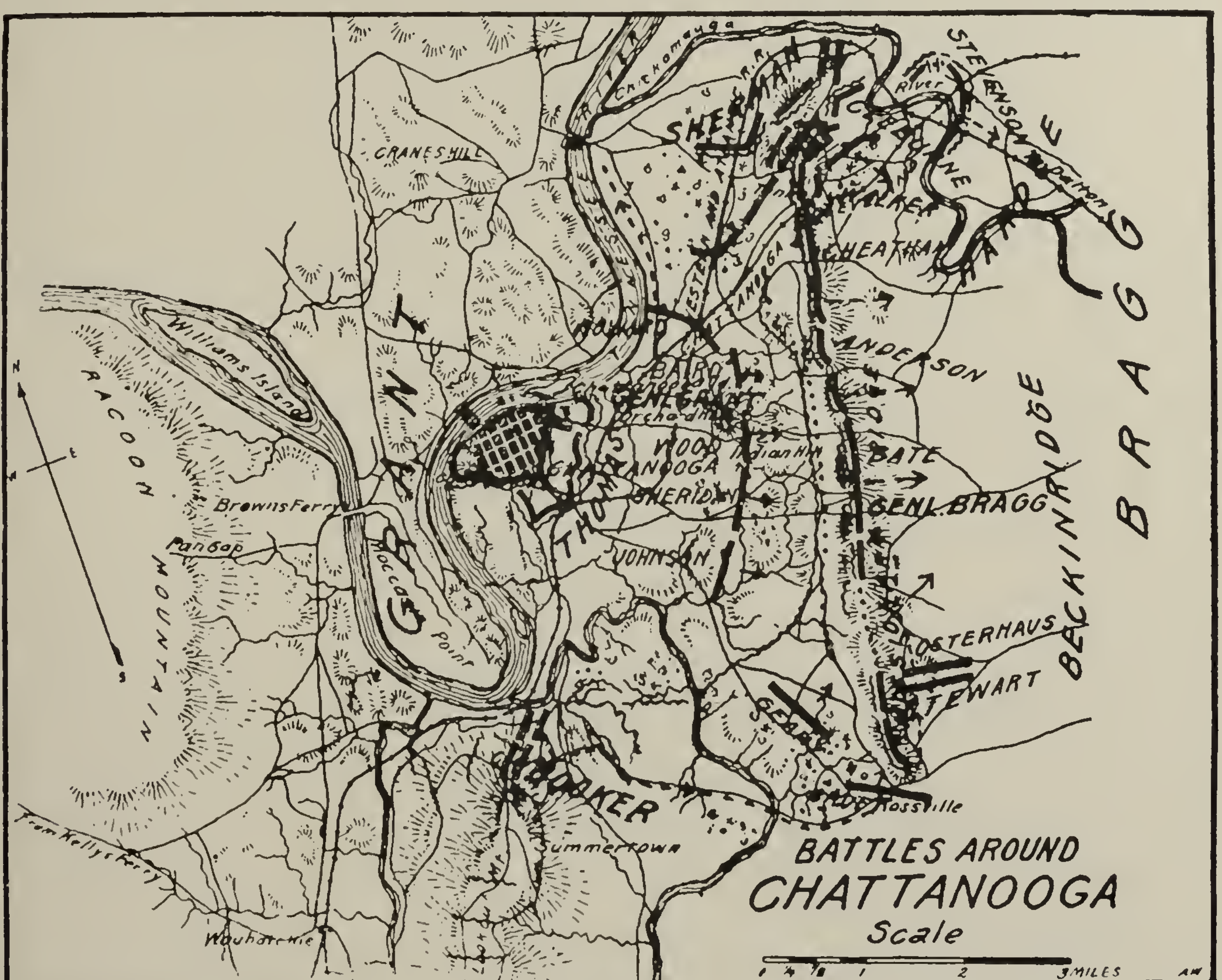

Fig. 6

the Confederate position, and consequently Thomas's troops had remained halted waiting to attack the center.[70] Finally, Grant ordered Thomas to assault with four divisions and capture the first line of entrenchments in his front, and there to halt and await orders.[71]

At 3:30 P. M. Thomas's line of about 30,000 men attacked on a front of two and one-half miles. Missionary Ridge along this line was several hundred feet high, with steep slopes broken by many ravines, and was occupied by the Confederates with about 20,000 men, the main line of resistance being on the crest.[72]

Thomas's assault captured the first line of entrenchments with the bayonet and the troops there halted as ordered but were subjected to severe fire from the trenches above.[73] One after another the regiments continued the assault, without definite orders and soon the whole line was advancing, making by

[69] 55 RR 34, 750.
[70] 55 RR 34, 318.
[71] 55 RR 96, 190.
[72] 55 RR 95, 665, 666.
[73] 55 RR 34, 190.

accident a coordinated attack, whereupon the crest of the ridge was captured, and the center of Bragg's position was won.[74] The Confederates gave way in panic.[75]

Meanwhile, Hooker with three divisions had reached the pass at Rossville. He had been delayed four or five hours due to the necessity of forcing a crossing of Chattanooga Creek against a small Confederate detachment.[76] Upon his arrival, he turned Breckinridge's wing and, almost unopposed, advanced northward, with one division on top of the ridge and one on each side, until he connected with the right of Thomas's line about sunset.[77]

On the Confederate right wing, Hardee moved a division of Cleburne's troops under General Cheatham across and at right angles to the ridge, facing south, and maintained his position and troops intact.[78]

General Bates, under orders from Bragg, placed his division, which was the only Confederate division south of Cheatham's not entirely routed and out of hand, to hold a position covering the roads for the retreat upon the depot at Chickamauga. This he effectually did while the soldiers of the routed left and center made their way to the rear in great disorder.[79]

Hardee was then ordered to withdraw the right of the line which he had held against all of Sherman's attacks. This he did during the night in good order. There was no attempt at pursuit by Sherman during the night.[80]

Upon reaching Chickamauga the Confederate army continued its retreat to Ringgold.[81]

On the morning after the battle, Sherman was sent in pursuit by way of Chickamauga Station, while Hooker marched by way of Ringgold. The country and roads were fully known by the Confederates, but equally unknown by the Union forces, and all bridges over the Chickamauga River were destroyed by the Confederates in their retreat. However, the river was fordable at several places.[82]

The Confederates reached Ringgold, where Clebourne's division checked the Union pursuit on the twenty-seventh. The Confederates then withdrew to Dalton, and the pursuit was suspended on the twenty-eighth at a distance of about twenty miles from Chattanooga.[83]

Grant states: "Had it not been for the imperative necessity of relieving Burnside (at Knoxville) I would have pursued the broken and demoralized retreating enemy as long as supplies could have been found in the country."[84]

The Union army lost 757 killed, 4529 wounded, and 330 missing, total 5616. The Confederate loss in killed and wounded was less than the Union owing to the fact that they were protected by their entrenchments and their panic was soon covered by darkness, but their loss in prisoners was large, amounting to about 5000.[85]

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[74] 55 RR 35, 666.
[75] 55 RR 27, 665, 667.
[76] 55 RR 34, 318.
[77] 55 RR 319, 665.
[78] 55 RR 665.
[79] 55 RR 665, 742.
[80] 55 RR 35, 635.
[81] 55 RR 666.
[82] 55 RR 35, 665, 666.
[83] 55 RR 26, 35, 666, 755.
[84] 55 RR 35.
[85] 55 RR 26, 36.

V. Comments

THE SIEGE OF CHATTANOOGA

After the battle of Chicamauga, Bragg, according to the custom of the times, delayed pursuit for a day, allowing Rosecrans to entrench himself in Chattanooga. Thereafter, Bragg, as Longstreet remarks, attempted to starve out Rosecrans by investing him on the only side from which he (Rosecrans) could not get supplies. After a week's delay Bragg sent his cavalry to operate on Rosecran's line of supplies. In the meantime this cavalry had been scattered to the four winds, and Bragg, instead of assembling it for a coordinated operation, ordered it against the Federal communications in three columns. Two of these columns were defeated in detail by the Union cavalry, while the third never moved. The chief reasons for the failure to starve out Rosecrans are therefore obvious.

Bragg's failure to hold Lookout Valley was due to the fact that there was no road leading from the position of the Confederate main body to Lookout Valley.

Jenkin's night attack on Geary depended for success on Law's containing a force three times his strength. It could not be done at this stage of the war.

GRANT'S TACTICS

Thomas's attack on November 23 was too strong to serve the purpose of a reconnaissance in force. If Bragg was really withdrawing he would, in the twenty-four hours that had elapsed between the time of origin of the deserter's information and the time of attack, have already cleared his position by several miles with his main body and a force of 10,000 men would certainly have been able to puncture his rear guard. The remainder of Grant's army could then have been set in motion in the decisive direction. In fact, the attack actually served to cause Bragg to strengthen his forces by the recall of Cleburne, whose entrainment for Knoxville was under way and had originated the report, and whose stubborn defense of the right of the line and later rear guard action probably saved Bragg from annihilation. This attack secured Sherman's river crossing, however, though not made for that purpose, and was therefore, by accident, a sound tactical move.

Hooker's attack was forced on Grant but it should have been, according to the rules of war, postponed until the twenty-fifth. However, its astounding success actually probably served to lower greatly the morale of the Confederate forces as the Union flag on Lookout Mountain was a symbol of disaster that every Confederate on Missionary Ridge could see.

Sherman's river crossing as originally planned by Grant was a hazardous undertaking. Grant did not originally intend to have Thomas attack until Sherman had effected his crossing. With Orchard Knob still in their possession Sherman should have been defeated by the Confederates at the river. It looks as though Grant was trying to repeat Vicksburg on a small scale. Bragg was

too good a general and too aggressive to try such a scheme on. With Orchard Knob in Grant's hands the Confederates could not attack Sherman at the river without exposing themselves to an attack in the flank or rear.

Grant's simplest and best plan would have been to have held Sherman's pontoons in reserve to secure his river crossings and to have concentrated his entire force at Chattanooga and then made a coordinated attack on Bragg, penetrating the Confederate position along the Chattanooga Creek.

Bragg attempted to hold a position which gave the attackers the advantage of interior lines, which should be a chief advantage of the defense. Grant tried his best to give the interior lines back to Bragg but providence intervened.

BATTLE OF LOOKOUT MOUNTAIN

The defeat of the Confederates at Lookout Mountain appears to have been due entirely to poor leadership. It is hard to know where to place the blame because it rests on Bragg, Stevenson, Jackson, Moore, and Walthall, and also on Hardee who was in command of Bragg's left until shortly before the battle.

Walthall's breastworks were so sited that a flank attack took them from the rear from higher ground. The "new" line was so close to the Summertown road that, with an active enemy in its immediate front, the plateau was untenable. The pickets were too far away from the main bodies to be effectively supported. They should have been instructed to fall back at once by a pre-arranged route in case of a general attack, should have been fewer in number, and should have been better sited. During the battle Stevenson passed the buck to Jackson, Jackson passed it to Walthall, and Walthall tried to fight 10,000 men with 1000. Neither Stevenson, Jackson, Moore, nor Walthall appears to have known what the plan of defense was, although they were the men who had to execute it. When they finally formed a line to oppose the advancing Federals, the Confederate soldiers, although outnumbered at the point of contact by about two to one, stopped the attack in about a half hour or hour and within a few hundred yards.

SHERMAN'S RIVER CROSSING

As this crossing was unopposed it reduced itself merely to an excellent piece of engineering.

After the crossing was effected Sherman was too timid. With nearly 18,000 men he marched up to Bragg's flank and waited for Bragg to try to drive him out. An hour's fighting on November 24 would have put him in control of one of Bragg's main lines of retreat. Consequently, he fought all the next day trying to cut off Bragg and was entirely unsuccessful. His failure to seize the complete hill mass north of the tunnel seems to have been due to his astonishment at finding that his map was inaccurate and to a lack (perhaps momentary) of a ready eye for the ground, together with a disposition to let well enough alone.

In this operation Bragg had more success than he deserved. Although he probably did not know Sherman's exact strength he either did or should have

had twelve hours' notice of Sherman's advance and should have had an adequate force on his right flank to protect his line of retreat if he intended to stay put.

THE BATTLE OF MISSIONARY RIDGE

During the battle of Missionary Ridge the Confederates were able to defend successfully their right with 12,000 men under Cleburne (a subordinate of Hardee) against 20,000 men under Sherman because Cleburne had arranged his troops in depth to garrison supporting, but echeloned, tactical localities and had used reserves for counterattack, while Serman attacked repeatedly on a narrow front in piecemeal fashion.

There was a little distance between the Confederate right and center. The center was held by about 20,000 men against Thomas with 30,000 men. The Confederates were, for many reasons, unable to defend successfully the center. The outpost lines were held in too great strength, considering that there was no intention to reinforce them, that there were no covered routes of withdrawal, and that they were apparently ordered to fall back in case of a serious attack. The main position lacked depth, and such depth as it had was not utilized—all troops were placed on one straight line practically along the topographical crest of the ridge. At the time of Thomas's attack the Confederate center had no reserves, either general or local. It was inevitable that if Thomas attacked with 30,000 men he would drive in the Confederate outposts, and that if he then quickly reformed in the rifle pits of these outposts and launched a coordinated attack all along the line, the Confederate line would necessarily be punctured somewhere. Once punctured, the troops making the penetration would necessarily take the Confederate line in flank and rear and roll it up, provided the simultaneous attack was continued all along the line to hold the Confederates in place.

In disobedience of orders the Union troops, after taking the rifle pits of the Confederate outposts, did make a coordinated attack. The men went first and the officers followed and caught up with them. The inevitable happened.

There was a little distance between the Confederate center and left. The left was held by about 4000 men under Stewart. It was attacked by Hooker with 11,000 men, but first Hooker had to force a crossing of the Chattanooga Creek. Hooker's attack at this time and place was logical and undoubtedly expected, yet only a small detachment was used by Bragg to oppose Hooker's advance, and the Confederate left was not refused. Hence, when Hooker finally got over the creek, near sunset and, marching north, took Stewart's 4000 men in flank and rear, they naturally fell back to the north and into the arms of Thomas's 30,000 successful troops. Some then escaped by running to the east.

BRAGG'S CONDUCT OF THE CAMPAIGN

Bragg, by failing to pursue vigorously after Chickamauga, lost his best chance of destroying Rosecran's army. Vigorous and immediate pursuit after Chickamauga would probably have resulted either in the capture of Rosecran's

army or in driving it in complete disorder out of East Tennessee, and Burnside would then have been easy prey. When hours were precious Bragg wasted a day. It was at this time that General Forrest, anxious to pursue, remarked that each hour was worth two thousand men.

Having thus lost his best chance to destroy Rosecran's, Bragg might yet have bagged him had he thrown his cavalry and twenty thousand infantry across the river north of Chattanooga.

Failing to do this, Bragg still might have starved Rosecran's out by sending all his cavalry at once to destroy the Federal communications. When Chicamauga was lost, Union reinforcements were immediately started to Rosecrans. When days were precious Bragg wasted a week before sending out his cavalry and then mismanaged their maneuvers.

Hooker having arrived and Sherman being close at hand, Bragg detached 20,000 of his best men and took up a passive defense. The force detached was not large enough to insure its complete and speedy victory in the task assigned, and the force remaining was not large enough to protect the communications of the force detached. Obviously one or the other should have been made sufficient for its task. Had he retained Longstreet, Grant's 65,000 men would hardly have inflicted a serious defeat upon 55,000 Confederates who, though poorly led, were yet as well led tactically as were the Federals. Had he sent 35,000 men against Burnside's 13,000 he should easily have captured Knoxville and reopened the railroad line from Richmond to Chattanooga.

GRANT'S CONDUCT OF THE CAMPAIGN

Grant's tactics were no better than Bragg's, but in his general conduct of the campaign there is little to criticize. He held on to the ground gained, built up his communications, and brought up his reinforcements as rapidly as possible. With all the War Department and the President urging attack, he nicely calculated the time available and finally, with overwhelming forces, attacked vigorously just in time to save Burnside and East Tennessee. While a more prolonged and stronger pursuit of Bragg after Missionary Ridge might have cost Bragg much, it might also have permitted Longstreet to capture Knoxville.

Hurried preparation for war always means great loss, great loss in efficiency and health.—**V. V. Vaughan, M. D., University of Michigan.**

Colonial Forts of the Gulf Coast

FLORIDA, ALABAMA, MISSISSIPPI, LOUISIANA, AND TEXAS

THE discovery of Florida must be credited to Juan Ponce de Leon, who, while in search of the "Fountain of Youth," sighted the coasts of Florida on Easter Sunday, March 27, 1512. A week later he landed in the vicinity of St. Augustine, took possession of the country in the name of his sovereign, and began his search for the mythical fountain whose waters could restore old age to the bloom of youth. For two months he searched, but at last he became discouraged and returned to Porto Rico.

From its first discovery, Florida took a firm hold upon the imagination of the Spaniards, whose minds conceived wonderful dreams of immense wealth in cities and mines within its unexplored interior. In 1528 Pamphilo de Narvaez, duly commissioned to conquer and govern Florida, landed near the Bay of Espiritu Santa (Tampa), probably in Clear Water Bay, and spent five months in a fruitless quest for gold and in exploring the country to the north and west. Becoming discouraged, he built boats for his command, embarked his forces near the head of Apalachicola Bay, and sailed for Mexico. Eleven years later Ferdinand de Soto landed about six hundred men in Tampa Bay and traversed the country in a westwardly direction to the Mississippi River, where he died in 1542.

Other expeditions to Florida and the Gulf Coast followed, but for many years, even after the shores of the gulf became well known, the Spaniards made no attempt to establish permanent settlements in the region. These Spanish Conquistadores traveled rough-shod over the country, seeking gold, silver, and precious stones. Leaving death and destruction in their wake, they proved to the world that the wealth of the Gulf Coast lay not in minerals and jewels; and caring nothing for agricultural pursuits, they had not at the end of fifty years a single settlement on the Gulf.

Military occupation was, of course, necessary if the country was to be subdued; and the few settlements which the Spanish undertook were established for the purpose of exploiting the country or for holding the French at a distance. As early as 1558, Philip II, of Spain, instructed Luis de Valesca, Viceroy of New Spain, to undertake the settlement of Florida. Valesca decided upon Pensacola as a satisfactory site for the new colony, and in the summer of 1559 he sent there about fifteen hundred soldiers and settlers. For some unexplained reason the site turned out to be unsatisfactory to the members of the expedition, and the garrison was recalled during the following summer.

After the close of the period of exploration, the Gulf Coast received no attention from Spain until France, working down from Canada by way of the Mississippi, set up a claim to a part of this shore line. It was La Salle who, after descending the Mississippi River, first conceived the idea of establishing

a French colony on the Gulf. He returned to France for that purpose and fitted out a frigate and three other vessels with materials and with about two hundred and eighty men. On the trip across the Atlantic, the ketch *St. Francis* was captured by Spanish privateers, but the three remaining vessels reached the Gulf early in 1685 and began their search for the mouth of the Mississippi. Contrary winds and a lack of knowledge of the gulf water carried La Salle far to the westward and forced him to land, in February, on the coast of Texas.

The frigate *Aimable,* crossing the bar at the entrance of Matagorda Bay, grounded and was wrecked, but the other vessels successfully negotiated the passage and landed the colonists. In March, Beaujeau, commanding the brig *La Belle,* left for France after landing twelve guns for the protection of the community, but he carried away with him much of the ammunition. After his departure, La Salle built a fort at the western extremity of St. Bernard Bay, and garrisoned it with a hundred men. He then began the exploration of the surrounding country and, in April, built a fort on Point Hurier. After Easter the colonists removed to a new location on Garcitas Creek, where a rude post called Fort St. Louis was erected. Here the twelve guns were mounted and a subterranean magazine built.

Early in 1686, the last ship was cast ashore in a hurricane and great quantities of supplies were lost. La Salle thereupon set out on foot with a portion of his command to find the Fort St. Louis of the Illinois—an expedition on which he lost his life. The people left behind at Fort St. Louis received no succor from France, and by 1687 practically all of them had died of disease or starvation.

The passage down the Mississippi by La Salle and his subsequent attempt at the establishment of a colony aroused Spain to the necessity of having more concrete evidence with which to establish her claims to the vast territories of Florida and Louisiana. In all the two hundred years since the voyages of Columbus, Spanish projects at colonization of Florida and the Gulf Coast had been limited to the occupation of a fortified post at St. Augustine and to a few feeble attempts to establish other settlements.

In September, 1690, Count de Calvé sent Francisco Llanis, with a frigate, to explore the Bay of Espiritu Santa (Matagorda) with a view to the location of a fortified base of supplies for priests and soldiers operating in the Province of Texas. Llanis selected a site for a fort on one of the small islands of St. Bernard Bay and reported that the best location for a settlement would be at the place which had been occupied by the French. Captain de Leon, sent to Matagorda Bay with one hundred and ten soldiers and some friars, erected the mission of San Francisco on the site of Fort St. Louis. This place existed for but a few years and was abandoned in 1693.

In 1692 an expedition was sent by the Viceroy of New Spain to explore the harbors on the west coast of Florida, and in 1698 a colony was established at Pensacola, where a small fort was built on the Barranca de Santo Tomé and named Fort San Carlos. This work was built of pine logs in the form of a

square, about a hundred yards on a side, and with four bastions. For armament it was equipped with a battery of sixteen guns.

The wisdom of increased Spanish activity in these regions became apparent in the winter of 1698, when Pierre Le Moyne d'Iberville arrived on the coast with an expedition of two hundred men in two frigates, two smaller vessels, and a fifty-gun ship which had joined him at San Domingo. This expedition had been prepared by Louis XIV of France to plant a colony in Louisiana, to which the French were setting up their claim. Iberville touched at Pensacola, then occupied by about three hundred Spaniards, and sailed thence westward to Biloxi Bay. Arriving at Ship Island in February, 1699, he built huts and tentatively established his colony at that place, while he searched for a more suitable location for permanent occupation. In April he moved most of the colonists to the eastern extremity of the bay, where he built a palisaded fort with four bastions, which was known as Fort Maurepas. Iberville says: "I erected a wooden fort, with four bastions; two are made of hewn timber, placed together, one foot and a half thick, and nine feet high; the other two of double palisades. It is mounted with fifty-four pieces of cannon." By May twelve guns had been mounted under the command of Sauvolle, Iberville's brother. Bienville, another and younger brother, was appointed lieutenant of the fort.

Towards the end of the year, Iberville learned that the English contemplated the establishment of a colony on the Mississippi, so he determined to secure the banks of that river for the French. Setting out in January, 1700, he chose a site about seventeen miles below the site of New Orleans, near English Turn, and began the erection of a fort which he named Fort La Boulaye. He also built and garrisoned a fort on Dauphine Island, below Mobile, and distant about forty miles from the Spaniards at Pensacola.

In 1701, having received instructions to remove his colony from Biloxi to Mobile Bay, Bienville left twenty men at Fort Maurepas and sailed with the rest of his establishment to the mouth of Dog River, where he built a fort in the spring of 1702. The settlement received the name of Mobile, and the fort became Fort St. Louis de la Mobile. This settlement suffered much from the high spring floods, particularly in 1709, and was removed in 1711 to a spot near the present site of Mobile. Here was built a wooden fort, which gave way in a few years to an extensive fortress of brick, with bastions, demi-bastions, half-moon, deep ditches, covered way and glacis, mounting sixteen guns, and called by the French Fort Condé and later, by the English and the Spanish, Fort Charlotte. A small garrison was left at the mouth of Dog River, and that post continued to be manned for several years.

In 1708 an English privateer from Jamaica attacked Dauphine Island, the chief depot of the French, and carried off a considerable amount of valuable supplies.

In 1712 the French had six forts within the territories claimed by them: Fort Boulaye upon the Mississippi River, a fort upon Ship Island, another upon Dauphine Island, Fort Maurepas at Biloxi, Fort St. Louis de la Mobile at

Mobile, and Fort Condé at New Mobile. These forts were all of miserable construction, being made of materials readily at hand, such as stakes, trees, and earth, with portions of them covered with palm leaves. Governor Bienville had been very energetic in his endeavors to insure French control of the region, but he made the mistake of scattering his command among a number of small, widely separated posts, and the equally great mistake of attempting to establish his colony upon a commercial rather than upon an agricultural basis like that of the Atlantic Coast colonies.

In 1713, M. de la Motte Cadillac, the new governor, decided to remove his headquarters from Mobile to Biloxi Bay. Old Biloxi had been accidentally burned, so he erected another fort upon the point of land immediately fronting Ship Island, at a place which was called New Biloxi. The fort was sometimes called Fort Louis. In 1717 a hurricane, sweeping over Dauphine Island, choked the harbor with sand, whereupon Ship Island became the principal depot and place of anchorage. The fort on the island was rebuilt and storehouses were established.

Fort Rosalie, built by the French in about 1716 on a bluff overlooking the Mississippi above New Orleans and intended primarily as an Indian post, was an irregular pentagon, enclosed by palisades, and without any bastions. It was destroyed by the Indians in 1720, but was rebuilt. In 1764 the site was occupied by the British with Fort Panmure. At that time Fort Rosalie was in ruins.

During all the early years of the century, the Spanish continued the inactivity which had characterized the two preceding centuries. Neglectful of their opportunities, they had permitted nothing to disturb the even tenor of their existence at Pensacola. In 1700 the governor had visited Ship Island to protest at the French incursion into Spanish territory, but the voyage was without result and he took no further action. In 1704 Fort San Carlos was burned to the ground and rebuilt as a compact, though small, semi-circular structure, solidly put together. In 1715 a new mission, located further down St. Bernard Bay, was established in place of that of San Francisco in Texas.

By 1717 the extension of French settlements in Louisiana began to cause much uneasiness in Pensacola, and in that year the governor had the defenses strengthened. In the following year, the Spanish built Fort San Marcos de Apalache at St. Mark's, and the French erected Fort Crèvecoeur on St. Joseph's Bay, east of Pensacola. This was too much for the Spanish, and the governor remonstrated to such effect that the French fort was evacuated within a few months. The Spaniards then built a fort upon the site, but soon afterwards abandoned the place.

The rupture between France and Spain first occurred in Europe, but as soon as Governor Serigny at Mobile learned that war had been declared, he decided upon an expedition against Pensacola. Sending some eight hundred Indians by land, he embarked with about four hundred men on three vessels, hoping to capture the Spanish stronghold in a surprise attack. Landing upon Santa Rosa Island, early in 1719, he captured a Spanish outpost. Dressing his men in

Spanish uniforms, he crossed over to the mainland and quickly captured Fort San Carlos. The French account says that they surprised the Spanish commandant in his bed and took the fort without firing a shot; the Spanish account says the fort surrendered after an attack by four French frigates.

Bienville garrisoned the fort with some men under Chateaugné, and then returned to Mobile. The Spanish at Havana fitted out two ships to retake Pensacola. Chateaugné declined to surrender when attacked and a lively engagement followed without a great deal of damage to either contestant. During the night many of the garrison deserted, and on the next day the French commander surrendered.

The Spanish governor immediately strengthened his defenses, "and to give additional defence to the entrance of the port, threw up a little palisade fort on the point of St. Rosa Island." He then set out with two brigantines to attack the French settlement on Dauphine Island, where "there was no fort, retrenchment or other defence, but a battery on the eastern point of the island." The French, although outnumbered, were able to prevent a successful landing on the island, so the Spanish undertook a bombardment of the fort and the town. For four days the garrison of one hundred and sixty Frenchmen and two hundred Indians, aided by one vessel which was anchored near the fort, withstood the attack. The arrival of five French vessels caused the Spanish to return to Pensacola.

With reinforcements, Bienville was now able to prepare another expedition against Pensacola. In September he landed a large force on the perdito and proceeded to assail the town. Upon the appearance of the French and Indians before the fort, the garrison made a show of resistance and then retreated to a new fort, called Principe de Asturias, which they had hastily erected on Point Siguenza. The French vessels having entered the harbor and the Spanish ammunition having been virtually exhausted, the new fort was forced to surrender. For the third time in three months Pensacola changed hands.

The French felt that they could not spare the force necessary to garrison the defenses at Pensacola, so they destroyed the fortifications, burned the town, and returned to Mobile. However, they left behind a guard in charge of one small battery, and Pensacola remained in French possession until after the treaty of peace by which it was restored to Spain. Fort San Carlos was thereupon rebuilt in substantially its modern form; and in 1722 another fort was built on the point of Santa Rosa Island, near the site of Fort Pickens.

The French continued to spread out in all directions by means of their small detached posts. In 1721 a vessel with a small force was sent to occupy Matagorda Bay in Texas and to build a fort. This was done, but the hostility of the Indians soon caused the French detachment to withdraw. The Spanish then located a garrison on the site formerly occupied by La Salle, and called the place Our Lady of Lareto. Ninety men were located there in 1722, but ten years later the number had been halved.

In 1722 Sieur de la Tour established a settlement at Balize at the extreme mouth of the Mississippi, on the southwest passage. Here, on the soft ground,

the French formed a military post, erected a fort on piles, and mounted a battery which covered the anchorage and the entrance to the river. The garrison. at this place, usually numbered about fifty men. The magazine and part of the fortifications were swept into the river in 1768, and a new Balize was then established.

Fort Condé, which had been begun at Mobile in about 1717, was completed in about 1722. Substantially built of brick, with four bastions and a large number of casemates, it was far the best fort in Louisiana. Nevertheless, in this year, New Orleans was established and fortified as the capital of the Province.

Notwithstanding the number of forts in French territory, France was nowhere very secure in her possessions. All the garrisons were small and a very limited number were within supporting distance of other forts. Finances were in a parlous state, and no money was available for the maintenance of fortifications. Consequently the forts deteriorated rapidly, and French activity along the coast was much reduced. For forty years very little was accomplished in the line of coast defenses, and the French colonization of the territory advanced so slowly that France finally decided to withdraw from the country on the best terms practicable.

On the tenth of February, 1763, after the conclusion of the French and Indian War, a treaty of peace was signed at Paris. By it all the French possessions in North America eastward of the Mississippi, from its source to the Iberville River and thence by Lakes Maurepas and Ponchartrain to the Gulf of Mexico, were surrendered to Great Britain. At the same time, Spain, with whom England had also been at war, ceded all of East and West Florida to the British Crown. The French possessions west of the Mississippi and the New Orleans area were ceded by France to Spain. England had driven France from the New World as she had already driven Holland. Only Spain and Russia remained.

Fort Condé at Mobile, included with the grant to England, became Fort Charlotte. The forts at Pensacola were called Fort St. Michael and Fort St. Bernard.

Shortly after their occupation of Louisiana, the English built Fort Bute on Point Iberville, where the Iberville River enters the Mississippi. This was, at first, a blockhouse with a small stockaded fort mounting six pieces of artillery and housing comfortably fifty men. In the course of time it became a strong military post and trading center, for it was considered to be "a Post of the utmost Consequence lying Contiguous to New Orleans." A fort at Baton Rouge was also garrisoned by a detachment of soldiers sent by Governor George Johnston of West Florida.

At the outbreak of the Revolutionary War, Fort Charlotte and the forts at Pensacola were the only forts of any consequence on the Gulf Coast, but even these were in a dilapidated condition. Fort Charlotte, at Mobile, was a square of about ninety yards on each front, with four bastions. The scarp wall and the parapet were built of brick, the scarp being about sixteen feet from the bottom to the cordon, with the parapet rising a little over four feet above the

cordon. Under the ramparts of the curtains of the three fronts were small casemates arched with brick. A glacis and a covered way surrounded the fort. The embrasures needed repairs, and the walls and casemates required new facing—the latter particularly, for they were "much out of repair and let in Rain." The sleepers of the platforms being rotten, some needed "entirely to be new Laid and others to be repaired with Planks."

The fort at Pensacola was tetragonal in form, with salients at corner. At each angle a small round tower projected a story above the curtains and mounted the smaller guns. The fort at Santa Rosa Island covered the entrance to the harbor.

When hostilities broke out between England and Spain in 1779, Don Bernardo de Galvez, Governor of Louisiana, invested the English fort at Baton Rouge, which was in West Florida. Lieutenant Colonel Dickson, in command, found himself unable to resist the enemy's forces, and surrendered to Galvez.

In 1781 Governor Galvez and Admiral Salamo laid siege to Pensacola. The place was strongly fortified, and held by a thousand men under the command of General Campbell. The English bravely defended Forts St. Michael and St. Bernard for a long time against the Spanish bombardment, but an unlucky accident caused the explosion of a magazine of Fort St. Michael. The explosion carried away a part of the wall of the principal redoubt and resulted in the capture of the fort. Realizing that the loss of Fort St. Michael rendered Fort St. Bernard untenable, General Campbell did not await the Spanish assault, but capitulated with honorable terms.

The treaty of peace between Great Britain and the United States, signed in 1783, surrendered all territory east of the mississippi between the Great Lakes and Florida, and set the southern boundary of the United States at the thirty-first degree of North latitude from the Mississippi to the Chatahouchee River, thence to the Flint, thence to the head of St. Mary's, and down that stream to the sea. England had not then long held possession of Florida and had recently had some of that territory taken by force. She was not, therefore, particularly reluctant to part with the country, and so, without defining boundaries, she ceded Florida to Spain. The boundary dispute thus opened up, continued for a dozen years, Spain claiming that England was not in *de facto* possession of West Florida and could therefore confer no title to any portion of it. The United States ultimately won the dispute, and a treaty was signed in 1795 confirming the boundary line agreed to between the United States and Great Britain.

In 1793 Governor Cardonelet, governor of Louisiana, strengthened the defenses of New Orleans. The fortifications which the French had placed around the city had decayed, so the governor planned a new system. Southeast and immediately above the city Fort St. Louis was built upon the river, while Fort St. Charles was erected immediately below at the northeast corner. Fort St. Ferdinand, a strong redoubt, was erected at the rear opposite the center of the city, with Fort St. John and Fort Burgundy at the northwest and southwest angles, respectively. These works were connected by deep ditches, and a battery was placed at the center of each flank of the town. The batteries constructed by

the French at English Turn were abandoned, and Fort St. Philip was erected on Plaquemines, with a small fort on the opposite side of the river.

In 1800 Spain ceded Louisiana to France, reserving to herself the Province of Florida, and in 1803 Napoleon sold Louisiana to the United States for fifteen million dollars. The coast forts obtained by the Louisiana Purchase were few in number and were in poor condition. At Baton Rouge there was a poorly constructed fort with a garrison of about fifty men. Behind New Orleans, on Lake Ponchartrain, at the mouth of the Bayou St. John, seven or eight miles from the city was a small work, called Fort St. John, which commanded the approach to the city from the lake. New Orleans itself was defended by five poorly constructed redoubts fast going to decay.

Fort St. Philip was thirty-two nautical miles from the Gulf on the eastern side of the Mississippi, and was an irregular work of brick. It was built on a bend in the river where ships, sailing up to New Orleans, would have to anchor because the turn was so sharp that a wind which would bring a vessel to the bend would be contrary on the next stretch. Like the other works, Fort St. Philip was in a ruinous condition. Across the river, and about a mile above the site of Fort St. Philip, were the ruins of a small closed redoubt, called Fort Bourbon. It had been intended to cover the flank of Fort St. Philip.

Following the Louisiana purchase, the western boundary line of Florida remained in dispute for a number of years, the Spanish retaining possession of Mobile. In 1813 General Wilkinson left New Orleans with six hundred men and sailed for Mobile. Landing his men, he took up a position in rear of Fort Charlotte and demanded its surrender. Captain Cayetano Perez, after some correspondence, capitulated and took his inadequate garrison to Pensacola. Wilkinson then sent nine guns to Mobile Point, where Captain Chamberlain erected Fort Bowyer. The following year the fort was dismantled by the orders of General Flournoy, who considered that it was not capable of defense. General Jackson, however, after his arrival at Mobile in August, decided to regarrison it.

During the progress of the War of 1812, the Spanish authorities of Florida sympathized with the British, who made use of Spanish territory as rendezvous for British vessels and troops. The American occupation of Mobile proved to be a considerable obstacle to the operations of the British in Louisiana, so in August, 1814, a British fleet was allowed by the commandant at Pensacola to use that post for the purpose of fitting out an expedition against Fort Bowyer. With the assent of Governor Manrequez, the British troops landed under Colonel Nichols and were quartered in Forts Barrancas and St. Michael, over which the British flag was raised. General Jackson remonstrated with the Spaniards, but received no satisfaction.

In September the expedition against Fort Bowyer sailed. Commodore Perry, with two sloops and two brigs, carrying thirteen hundred men and ninety-two guns, attacked the defenses on Mobile Point. The garrison of one hundred and twenty men, with twenty guns, under Major Lawrence, so gallantly defended their position that the attacking force was repulsed, and one of

the ships sunk. Disheartened, the British command returned to Pensacola.

Determined to counteract the British occupation of Pensacola, Jackson marched against that city in November with a force of five thousand Tennessee volunteers and a large body of Indians. In addition to the forts, the city was at that time protected by several batteries and by seven vessels of war which were in the harbor. Jackson advanced in a direct assault and the town was soon captured. Colonel Nichols, hard pressed by the Americans, blew up Fort Barrancas and escaped with his troops and his Indian allies to the vessels, which at once put to sea. General Jackson held the town but two days. Destroying the fortifications, he withdrew to New Orleans, while the Spanish Governor immediately commenced rebuilding the defenses of Pensacola.

During the Battle of New Orleans and the events preliminary to it, the British fleet was in action on the Mississippi. Some vessels bombarded Fort St. Philip, below New Orleans, on the 11th of January, 1815, and continued the attack for eight days without success. This failure, combined with the American victory on land, forced the British to withdraw from the Mississippi. Turning their attention to Mobile, they assembled a large naval force off Fort Bowyer and landed five thousand men in the vicinity. Twenty-five vessels anchored in a semi-circular position five miles in front of the fort, and thirteen ships-of-the-line took station two miles in rear of it. The Americans decided that the attacking force was overwhelming and, in February, surrendered Fort Bowyer to the British, who retained possession only until the first of April.

During the war with the Seminole Indians in 1817, it was ascertained that the Indians were incited to hostilities by British subjects, protected by the Spanish authorities in Florida. General Gaines, in March, 1818, invaded Florida, took possession of the weak Spanish post of St. Mark's, at the head of Apalachee Bay, and sent the civil authorities and troops to Pensacola. Jackson soon afterward marched on Pensacola. Upon his arrival, the Spanish governor fled on horseback to Fort Barrancas, at the entrance to Pensacola Bay. Here, when threatened by the American troops, he made some slight show of resistance and then surrendered. The United States were now in a position to make terms with Spain, and early in 1819, that nation ceded Florida to the United States. The treaty, which was ratified in 1821, confirmed the possession of the United States to most of the Gulf Coast, and set the Sabine River as the boundary line between the United States and Texas.

This latter province, largely unsettled along its uninviting shores, had never possessed coast forts of any consequence. Galveston Bay had been discovered by the colony of La Salle in 1686, but for many years it had remained deserted. It then became a stronghold for free-booters and smugglers. These were driven from the town, which then became a center for revolutionists. In 1819 a detachment of the Republican Army under General Long took possession of Bolivar point and there erected a fort which was known as Fort Bolivar.

In 1831 two other forts had been built in the vicinity. When the Mexican government established custom houses in Texas and undertook to collect duties, the collector of the "port of Galveston" lived near the mouth of the Trinity

River at the head of Galveston Bay. At this point, Colonel Blackburn, in 1831, had a fort erected to guard the land from surveyors and to protect the port from smugglers. This work was called Fort Anahuac.

A little further down the coast, at the mouth of the Brazos River, there was built Fort Velasco. This work, circular in form, was made of logs and sand, with strong stakes sharpened and placed close together all around the embankment. In the center, considerably higher than the outer wall, stood a bastion on which was mounted a nine-pounder. Lieutenant Colonel Dominic Ugartacha, in command, was given a garrison of about one hundred and thirty men.

In connection with the Texas struggle for independence, Captain John Austin of the Texas forces attacked Fort Velasco in June, 1832. With a detachment of one hundred and twelve men, and with the assistance of a schooner mounting one light gun, he managed to capture the fort.

By 1836 the Texan forts were valueless. Speaking of Fort Anachuac, the diary of a traveler states that the fort was, in that year, "dilapidated." It was in this year that Texas succeeded in her struggle with Mexico, and became a separate country. For years the Texans had been too busily engaged along their southern border to be concerned with coast fortifications. Soon it became unnecessary for them to consider possible international complications, for, in 1845, Texas was annexed to the United States. By this act of annexation the United States completed their acquisition of territory along the Gulf Coast, the southern boundary being fixed on the Rio Grande River by the War with Mexico.

Of all the forts built on the Gulf Coast, two alone were taken over by the United States in a more or less serviceable condition. Fort Barrancas at Pensacola and Fort St. Philip on the Mississippi had been built with some idea of permanency and could be utilized. The provision of any additional defenses which might be necessary for the future protection of these southern provinces now became a duty of the United States, a responsibility which they readily accepted as accompanying the increase in the territory of the nation. From an original coast line extending from Georgia to Maine, the shores of the United States had vastly lengthened, and now included all the coast from the St. Croix River on the north to the Rio Grande on the south. The United States were beginning to achieve their destiny.

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Military training has an important value entirely apart from its actual military value. This is conclusively proven in the numerous military schools of the United States. The majority of these schools disclaim any attempt to train soldiers, but include military training merely to make better citizens. They find that the man trained militarily learns obedience, promptness, cleanliness, orderliness, coolness, and secures that priceless asset known as executive ability —the ability to make others obey.—Richard Stockton, Jr.

Ships on the Battlefield

By MAJOR C. C. BENSON, Cavalry

EDITOR'S NOTE: *In this article the author discusses a subject which is, or should be, of outstanding interest to the Coast Artilleryman. The main theme is directed toward the necessity of modification of battlefield tactics to allow for the presence of large fast tanks with either or both sides. To illustrate his point, the author selects a situation from one of the current publications, adds tanks to one side, and discusses the consequent effect upon dispositions and developments. Quoting from the text, he shows the applicability of principles and the inapplicability of methods of today.*

The article is not a criticism of our present-day teachings, for no school can be expected to base its teaching today upon tomorrow's probabilities. It is merely an attempt to show wherein we must change our instruction and study.

The author neglects motorization—the mechanical substitute for cavalry—and the tankette or light tank—the mechanical substitute for infantry. Feeling that these are factors of importance, the JOURNAL *pursues the subject on the editorial page, although it is expected that the author will himself continue the discussion of mechanization and motorization in later articles.*

> *The unresting progress of mankind causes continual change in the weapons; and with that must come a continual change in the manner of fighting,—in the handling of troops or ships on the battlefield.*—Mahan.

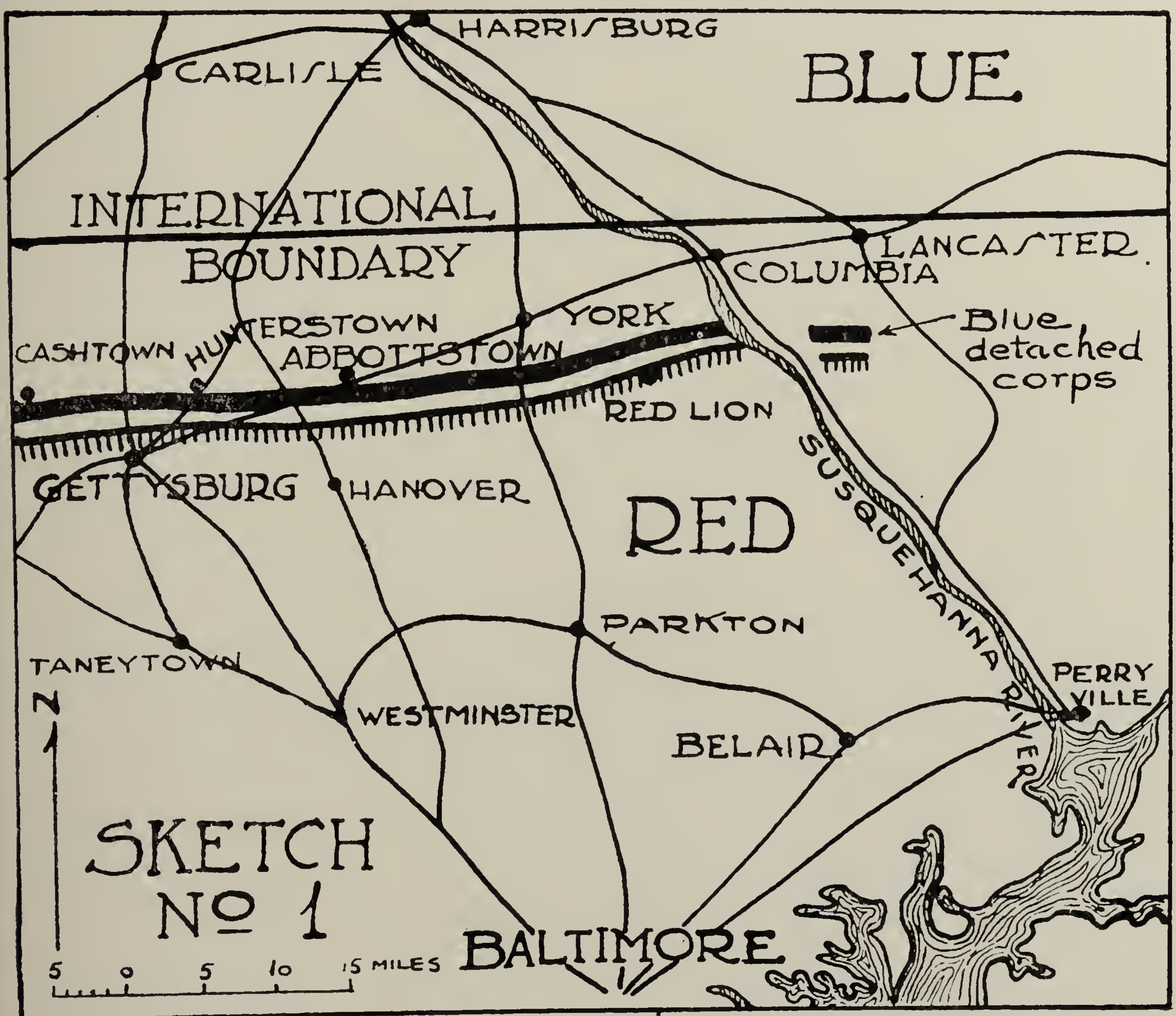
UNRESTING progress has given the Army a new weapon—the fast cross-country fighting machine. The new light tank (T1 E1), which was developed last year and is now undergoing service tests, maneuvers over rolling terrain at surprising speed. Last October a platoon of these tanks, moving under their own power, made a road march of 144 miles in two and a half days. In November, the new Christie machine covered the same distance in half a day—144 miles between breakfast and lunch. The Christie's amazing ability on the road, across country, and over obstacles leaves small doubt about its development into a first-class fighting machine. It has both strategical and tactical mobility; its iron lungs and steel muscles give it power to carry on where men and horses would drop from exhaustion. This combination of sustained high speed, fire power, crushing power, and ability to advance rapidly across country under machine-gun fire is dangerous—so dangerous, in fact, that we cannot afford to ignore it.

What effect will these fast fighting ships have on the battlefield? We have seen the development of another highly mobile weapon—the airship—and have noted the strenuous efforts made to perfect it for military use. As yet its place in the combat team is undetermined, but the fact stands out that when hostile air fleets engage each other, their direct effect upon ground troops ceases. Landships, however, will fight in actual physical contact with men on the ground. The scene of action, instead of being far aloft, may be in the midst of ground forces. When land fleets engage on terrain occupied by other troops,

NOTE: By special arrangement with the editors, this article appears in the March issues of publications other than the COAST ARTILLERY JOURNAL.

infantry and cavalry formations will be shattered, artillery positions overrun, signal communications disrupted, command posts isolated, and all semblance of order lost—unless we devise ways and means to neutralize this terrible new weapon. Regardless of what tactics the landships adopt, *their presence on the battlefield will necessitate drastic changes in the present combat tactics of infantry and cavalry.*

To provide specific data for a discussion of these ideas, let us turn to the current teachings of the General Service Schools. The series of studies included in *The Detached Corps* presents a situation (Chapter V) that is particularly well suited to our purpose. The situation is briefly as follows:

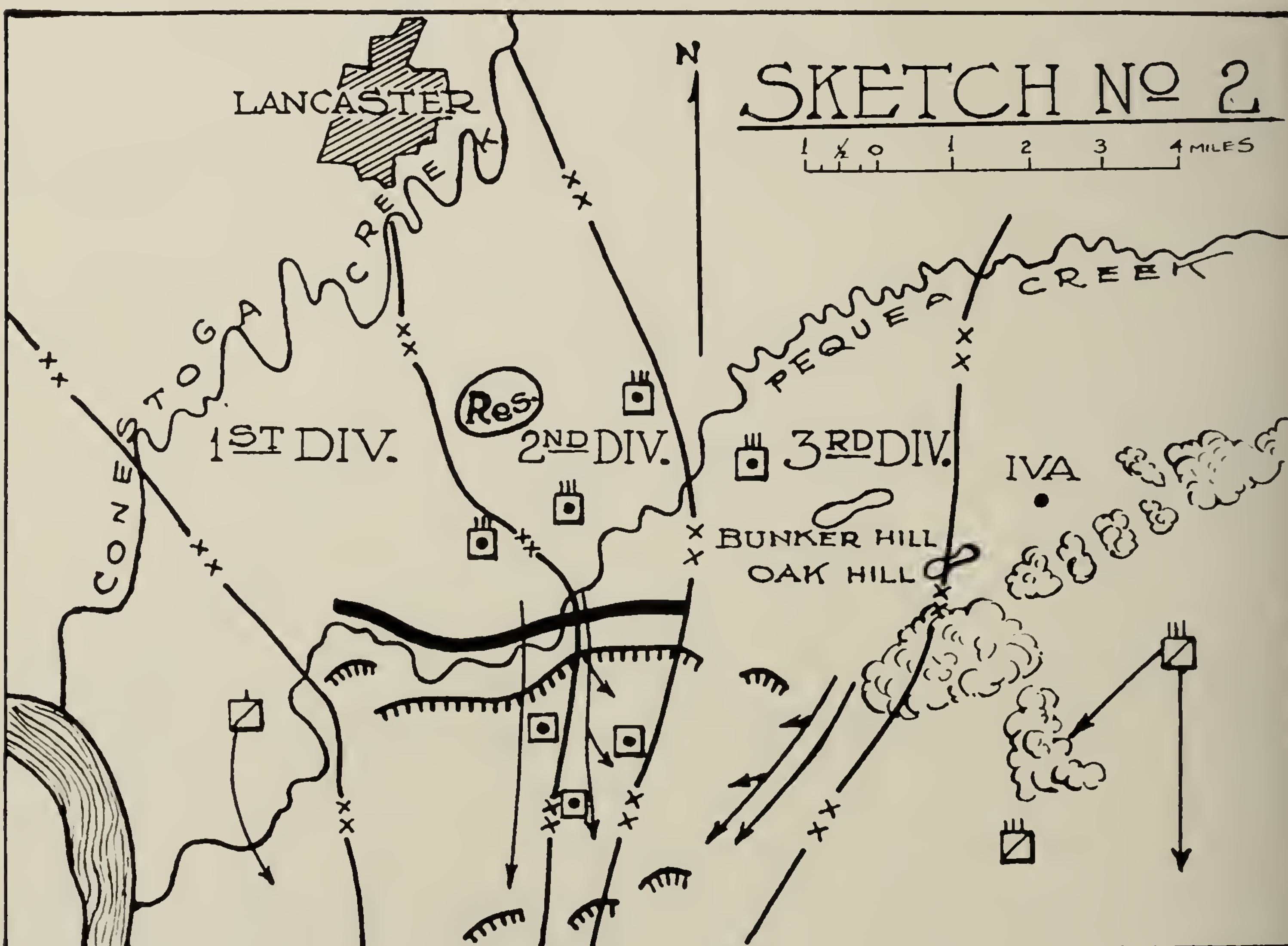


War was declared thirty-six hours ago. The Blue army (north), moving south into enemy territory, is in contact with the Red army, as shown in Sketch No. 1.

The Detached Corps (Blue I Corps), operating east of the Susquehanna River, sent its leading elements across the border near Lancaster early yesterday. It has orders: (a) to cover the left flank of the Blue army; (b) to be prepared to act offensively against the right flank of the Red army; (c) to prevent an advance by the Reds north of a given line. The Blue corps has three infantry divisions; a full complement of corps artillery; a reinforced regiment of

cavalry; and organic air forces reinforced by one pursuit group, one attack squadron, one airdrome company, and one bombardment squadron. The Blues have pushed back Red covering detachments, and have definitely located an intenched position occupied by the Red main body. The Corps is concentrated for an attack which will be launched at 4:30 A. M. tomorrow in an effort to envelop the east flank of the Reds, as shown in Sketch No. 2.

The Reds have two divisions, a regiment of cavalry on the east flank, observation planes, and the prospect of reinforcement from a division which at noon today was camped at Perryville, 30 miles away. The stage is now set for action.



Before we raise the curtain on the events of this drama, it will be necessary to examine some aspects of the contestants' pre-war military policies. The Blues had developed air forces which enabled them to state with assurance, "The Red air service is known to be weak." Air-mindedness, however, had led the Blues to neglect armored vehicles for fighting on the ground. At the outbreak of war, the Blues had only three weak infantry tank battalions, equipped with ten-year-old machines, and a few scattered divisional tank companies, similarly equipped with slow cumbersome tanks. Maneuvers in which these obsolete machines participated had misled the Blues; their training regulations were based on conceptions which gave tanks an extremely restricted role—and mistakenly

assumed a similar role for enemy tanks. On all matters pertaining to the movement, supply, and tactical use of armored vehicles, the war record of the Blues maintains a complete and eloquent silence.

The Reds had candidly recognized the value of fighting machines for ground troops. The Red Tank Corps, supported by consistently adequate appropriations, had fostered the development of improved machines, and had trained other Red forces in the tactical use of the new weapon. Suitable reserves of mechanized troops had been organized and partially trained. Educational orders placed with commercial concerns had prepared for war production of fighting machines for ground troops. At the outbreak of war, the Red Tank Corps had two mechanized brigades fully equipped with modern vehicles and ready for action. Each brigade had one regiment of fast tanks (130 fighting machines), one regiment of mechanized artillery, one battalion of mechanized infantry, armored cars, and various auxiliary units. Unknown to the Blues, the 1st Red Mechanized Brigade moved last night to Baltimore.

We may now return to the battlefield. Darkness has fallen. The Blues are moving masses of infantry and artillery into their final positions for the attack; the Reds are strengthening their defenses. The Red commander, however, is not willing to maintain a passive defense; he is preparing offensive measures to thwart the Blue attack. In response to his urgent requests, Red GHQ has attached the 1st Red Mechanized Brigade to his command. That Brigade, with an escort of Red pursuit planes, is now moving from Baltimore to the battle area.

Can it get there in time to change the situation? The distance to be covered is less than seventy-five miles. Under the conditions of the problem, the Reds will have to cross the Susquehanna River at Perryville. Beyond that point, a network of suitable roads is available for movement to the battle area. Three hours will be sufficient for high-powered machines of the Christie type, traveling on wheels, to cover the first sixty miles. A halt to refuel the machines, adjust caterpillar tracks, and to issue orders for the approach march, will consume another hour. An allowance of three hours more for the last fifteen miles is liberal, because the Reds are operating in friendly country where reliable guides are available. So far as time, space, and roads are concerned, the Red Mechanized Brigade can easily reach the battlefield before the Blue attack is launched.

If Blue observation planes discover and report the Red movement, their reports will have little effect. The Blue main forces are so nearly committed to action that any change in their orders will disrupt the whole plan. Blue air forces may attempt to hinder the Red advance, but they will have extreme difficulty in locating profitable targets, and will have to contend with the Red pursuit planes. The Blues will pay a heavy price for any damage that they may do tonight to the Mechanized Brigade; the net result will be to reduce the effectiveness of the Blue air forces for employment in the forthcoming battle. The Blue cavalry regiment, which has been providing security for the east flank, is the only force in position to obstruct a Red advance against the left and rear

of the Blue corps. To expect this regiment to stop the advance of 130 tanks is absurd. Fast tanks of the Red advance guard, advancing on a ten-mile front, will locate the regimental bivouac and rip into it before cavalry patrols can give warning. Galloping messengers from distant patrols, if not run down by the machines, will serve merely to guide the Red tanks directly into camp. A single tank in that area, running wild over shelter tents and through picket lines, will stampede the regiment. For the time being, the regiment will cease to exist as an effective force.

To brush this cavalry regiment aside may seem fantastic. Surely the Blue cavalry could do something to check the Red Mechanized Brigade! Suppose the demonstration regiment of our Cavalry School is placed in a similar situation. The enemy's advance is unexpected; it comes with such power and speed that there is little time for concerted action. What would the regiment do? What would any of our other cavalry regiments do to meet the advance of a mechanized force? We must find a satisfactory answer to that question.

The security measures of the Blue corps commander are apparently faulty—right in principle, but wrong in method. The principle, as stated in Chapter IV of *The Detached Corps*, is as follows: "The tactical concentration must be covered by a force of such strength and maneuvering power that the movements of the other elements will not be interrupted—." Had the Blue commander supplied his cavalry with armored cars, surprise would have been less probable; if he had possessed a mobile reserve of fast tanks and had known how to use them, the Red advance could have been blocked. Responsibility for the security of large forces rests largely upon the cavalry; consequently, *cavalry should be the first to recognize, teach, and apply the improved methods that fast cross-country fighting machines will provide.*

As a result of the failure of the Blue security measures, the Red Mechanized Brigade issued from the northern edge of the woods near Iva at 4:00 A. M. It deployed in battle formation, sent its infantry to secure Oak Hill and Bunker Hill, and attacked the left flank and rear of the Blue corps. For the purposes of this article it is unnecessary to go into the details of subsequent events. At this point, however, it may be worth while to refer to the Battle of Amiens, which was fought in August, 1918. The report of General Ludendorf on the failure of the German army to hold its ground, stated: ". . . the troops were surprised by the massed attack of tanks, and lost their heads when the tanks suddenly appeared behind them . . ." The German Crown Prince said: "Large numbers of tanks . . . rapidly attacked battery positions and headquarters of divisions. In many cases no defense could be made in time against the tanks, which attacked from all sides. Antitank defense must now be developed to deal with such situations." In passing we may note that the detached corps of 1929 is no more prepared to meet the new weapon than were the Germans in 1918.

The present combat tactics of the infantry apparently need overhauling. Among the principles stated in Chapter IV (The Corps Concentrates to Attack) of *The Detached Corps* is the following: "The cencentration should not be

started until it is reasonably certain that the enemy situation has taken such definite shape as to warrant the adoption of a scheme of maneuver. . . ." In Chapter V (The Corps Attacks), "An early decision usually is necessary in order to retain the initiative, or to strike the enemy before he can fully organize his position or receive reinforcements. . . . Before the attack can be planned in detail, the commander must have accurate information of the location, strength, and limits of the enemy's position." Mechanized forces, which combine sustained speed with tremendous hitting power, introduces a liquid element into an otherwise stable situation. They can, as we have seen, completely alter a situation in less than twelve hours. The Blue corps commander decided to attack thirty-six hours before his attack could be launched—ample time for the Reds to concentrate against him all their mechanized forces within 200 miles of the threatened point. Fairly accurate information about intrenched enemy forces can be secured as heretofore; but how can a commander determine the strength, location, and probable intentions of highly mobile mechanized units that the enemy holds in reserve? Only by continuing to ignore the powers of a mechanized force can we justify the statement, "The corps commander is thus assured that there will be no material change in the enemy situation during the development and deployment of his corps." New time and space factors, commensurate with the mobility of the new weapon, must henceforth be applied to the movement of ground troops. Large infantry units must accelerate their development and deployment or else gamble on the inactivity of hostile mechanized forces.

Another passage in Chapter V of *The Detached Corps* reads: "Surprise is an essential element of success. . . . With a large force, the surprise element of an attack generally is limited to the exact location, the strength, and the direction of the main effort." Against an enemy who holds fast powerful mechanized units in reserve, effective surprise by infantry becomes impossible. The enemy can concentrate his mechanized forces at the critical point long before our slow-moving infantry formations can apply dangerous pressure. Power in our main effort is not in itself sufficient; we must now have both power and speed. Unless infantry can devise ways to deliver its blows rapidly, it must forego the essential element of surprise. *The necessity for speed in development, in deployment, and in the attack indicates that the infantry must change its present combat tactics.*

How can the necessary changes be determined? First, we must have a clear statement of the probable uses and general characteristics of a mechanized force. The War Department can readily formulate this statement from data now at hand. Second, the Infantry School, the Cavalry School, and the General Service Schools can inject mechanized forces into their problems, just as is done with Air Divisions, and thus submit the subject to intensive study. The detailed solution of a single map problem in which the Reds have mechanized forces and the Blues have none would focus the attention of infantry and cavalry officers upon the need for new defensive tactics. Third, the Tank School can make a special study of the combat tactics of mechanized forces. This study

would help other service schools to estimate the situation more accurately. The above measures are practicable and can be put into effect at once without expense. Why wait for battle experience to impress upon us facts that we can learn now by study

The fast cross-country fighting machine is not a Jules Verne forecast of the future; it is a present reality. A reliable machine that we can depend upon to do all that this article implies, and more, has been built. If necessary, a thousand similar machines could be produced within the next six months. There is, however, a big gap between the invention of a new weapon and its application to battle conditions. One man invents the weapon; thousands must learn to use it. How to use ships on the battlefield and how to defend against them are problems which challenge the best brains in our Army. Changes in tactics, far more radical than those caused by aircraft, have got to come.

As pioneers, Army men conducted nearly all preliminary explorations in the early days of our history. They constructed roads, built bridges and canals, made maps and surveys of the great West, and afforded protection to early settlers. Up to 1855, there was scarcely a railroad in this country that was not projected, built, and operated in large part by the Army, while it projected practically all of the transcontinental railroads. The Army built the old Cumberland Pike running from Cumberland, Maryland, to St. Louis, Missouri, which was the most effective influence in opening up the Middle West. Its work includes the construction of lighthouses along our coast line as well as the deepening of important harbors and waterways.—**Gen. John J. Pershing.**

The Weak Spot in Military Progress

By Major Ralph E. Jones, Infantry

A farmer has no plow. He has a spade and a rake. He is ambitious and energetic. But he has no plow. Of course his work lags. The casual observer remarks, "The farmer is lazy. Look at the amount of his land that is not planted!" But the casual observer is unjust. He does not know that the farmer has no plow.

So it is with the weak spot in our military progress. We have no plow. *Our Army is lacking a suitable agency for general research, experimentation, and development.* We have supply agencies, and some of them (or all of them) have experimental and development sections for certain purposes. We have branch boards (Infantry Board, Tank Board, Air Corps Board, Cavalry Board, Field Artillery Board, Coast Artillery Board, and so on) each of which can make studies, within limits. But these minor agencies are severely limited as to what they may do, and they have, individually, scant resources with which to operate. And, most important of all, they are isolated one from the other. These spades, rakes, and other tools are of course better than nothing, but they cannot do the work for which the plow is needed. Criticism that attributes our slow progress to ultra-conservatism is unjust. The fault lies not there, but in the lack of a suitable agency. The missing element should be supplied.

This research and development organization that we need should include, under one chief, officers of the forward-minded type from all branches. It should have authority to call on certain troops from all arms for experiments and tests. It should have shops and mechanics available in liberal measure, and, of course, adequate funds for miscellaneous purchases, experiments, and the like. It should be responsible for developments and improvements in such matters as organization, tactics, arms, equipment, and methods of training and administration. It should, of course, consolidate and systematize the records of development and improvement projects. It should develop a systematic history of such matters, and thus in many cases avoid unnecessary duplication of effort. It should have cordial and cooperative relationships with the branches and the services. It should naturally not relieve the latter of any of their procurement, manufacturing, or supply functions, but it should take over from them their duties of devising new types of equipment. And it should take over, partially at least, the present duties of the branch boards. It should, in short, serve as a clearing house for progressive military ideas.

Although such an organization would improve the efficiency of minor investigations, it is in the many places where coordination is necessary that its tremendous value would lie. This includes coordination between the activities of cooperative branches and coordination between means and method. In inter-

Note: By special arrangement between the author and the editors, this article appears in the March numbers of publications other than the Coast Artillery Journal.

branch tactics, there is room for extensive developments of this kind; for example, between the Air Corps and any one of the other arms. We seem to be partly unconscious of the intimate relationship between means and method. In the proper investigation of tentative improvements in tactics, needs will arise for experimental equipment. Conversely, in designing new equipment, the minor details of tactical use may constitute governing considerations of no small weight. Let us rid ourselves of haphazard, isolated, duplicating, half-way research. Let us make it, instead, coordinated, comprehensive, and thorough!

As one specific example of the application of this plan, consider the problem of mechanization and motorization. Many agencies within the Army are at work on it—the Air Corps Board, the Tank Board, the Infantry Board, the Artillery Boards, the Ordnance Department, the Quartermaster Corps, and yet other branches and services—each more or less isolated and working under restrictions and handicaps. How much faster, how much more satisfactory, and how much more economical would be the progress if this effort were being made by one adequate and suitable organization!

To what extent have we been engaging in tactical research? The Service schools are, in general, busy teaching existing doctrines. They do not develop new doctrines and teach them. That is not their purpose. It would be inappropriate for them to do so, for conflict and confusion would be the probable results. The branch boards jot down their ideas and observations to the best of their ability—each along its own restricted lines, however. It falls to the War Department General Staff to effect coordination. But not even the best will and the greatest ability make it possible for officers, while at desks, to visualize completely and determine properly matters that should be determined by investigation, conference, experimentation, development, test, and more conference. Certainly our tactical research is not very thorough or coordinated. Surely tactics is in need of the coordinated research!

But how would such a new organization fit in with the General Staff? The answer appears to be, "Most favorably."

Let us first consider the War Plans Division. It prepares certain necessary plans. These plans, in numerous particulars, create the need for studies of details and for adaptations and modifications in organization and equipment. The new agency would do this work and thus supplement the work of the War Plans Division.

Let us now consider the four numbered divisions of the General Staff. They do work of a more characteristically general staff nature. Would the new agency take away from the General Staff some of its normal and logical duties? It would not. The chief purpose of the General Staff is to assist the commander in arriving at decisions, in forming plans, and in supervising administration, troops, and special agencies. No, the innovation would not interfere with the responsibilities of any division, or with the work of the General Staff as a whole. It would, of course, be the duty of the General Staff to examine the reports and recommendations of the proposed agency preliminary to executive action thereon by the War Department.

The citizens of our country do not favor a large army in time of peace, but they have often expressed their desire that their small army be highly developed and highly efficient. Let us not fail to heed that mandate! If we are not to fail, we must keep up-to-date. Our research and development must keep up the proper pace. But a spade and a rake are poor substitutes for a plow. Probably about one per cent of our money, brains, and man power is being devoted to research and experimentation. The ninety-nine per cent goes for plans, training, routine duties, supplies, and other activities of the Regular Army, the National Guard, and the Organized Reserves. It would appear that the rights of our citizenry and the best interests of national defense demand a revision of the ratios—a better effort in the field of research, experimentation, and development. This field of effort should be an outstanding element in the justification for our peace-time Army. It is an important, it not a vital, phase of our preparedness.

It is amazing to discover how little our citizens understand of this dramatic history of purely civic accomplishment. It is equally amazing to most of them when they do learn the facts. . . . After the San Francisco earthquake and fire in 1906, it was the Army that took charge of disorder and administered the forces of order. In the Galveston disaster of 1915 the Army made a record for heroic achievement. Similarly the constructive value of the War Department was felt in the Mount Pelee disaster and during the Ohio and Mississippi floods of 1912. There is a huge file of grateful letters received by the Department for its work in these instances and other similar.—Secretary of War, John W. Weeks.

EDITORIAL

Mechanization and Motorization

ON another page the JOURNAL presents an article on mechanization, wherein it is pointed out that the development of large, fast tanks has reached a point which calls for a marked revision of battlefield tactics. To illustrate his point, the author assumes a situation in which one side alone is equipped with such tanks, and in which neither side is possessed of modern light one-man or two-man tanks. Given such a situation, one side will be at a disadvantage which no revision of tactics can ever remedy. But will that be the normal situation?

All the powers are interested in mechanization, and England, France, and the United States, in particular, are making rapid progress. Accompanying mechanization in these countries is the subject of motorization. Armored cars, fast trucks for transporting cavalry, infantry, and cargo, heavy tanks, light tanks, self-propelled artillery, television, transmission of pictures by wire, and radio all go hand in hand to influence the battle of the future. All are not equally developed, but all are past the purely experimental stage. Armored cars were developed early in the World War and are entirely practicable. The high-speed truck and the fast tank are with us. It is understood that England has not found the one-man tank efficient as a fighting machine, but two-men tanks are but slightly larger and no slower. Television is new, but wire transmission of photographs is practicable. Not long ago a photograph taken from an airplane at Fort Leavenworth was delivered at Governor's Island within thirty minutes or some such ridiculously low time.

Can we not therefore visualize war of the future as an extremely high-speed and extremely mechanical affair? Advance reconnaissance work is carried out by airplanes and armored cars. Cavalry, transported by fast trucks, go where required for local reconnaissance to supplement the armored car. Infantry, moving more slowly, comes up, accompanied by light tanks and artillery which, probably, is armored. Fast trucks comprise the supply columns, to be supplemented later, perhaps, by the vehicles used to carry men, horses, and combat machines. Except in point of protection and of speed, is the situation materially different from that of yesterday? Everybody is better protected, and relative speeds remain unchanged. Cavalry still travels faster than the infantry; the artillery still has difficulty keeping up.

Airplanes and armored cars meet like weapons and one side or the other is forced in; both sides learn information of the other, one side more fully than the other; both sides deploy and endeavor to secure the advantage of position; tank meets tank, and both sides are subjected to artillery fire.

With the introduction of these new instruments of war, will not all of the principles and most of the major details of our present teaching remain almost

wholly unchanged? Will not the only material modification come in the time and space factors? We shall have to think faster and act faster; we shall require better and more rapid communication; our perspective must be larger; but otherwise, we can apply what we have learned in the past.

The large problem will be that of command. The commanding general must see—or visualize—the battlefront and he must have extremely rapid transmission of orders. These questions are not yet solved. Television and radio may furnish the solution, but they are not yet prepared to do so. What time may bring forth, no man may tell, but probabilities and possibilities should be discussed and the JOURNAL pages are open to the opinions of its contributors. Mechanization and motorization are upon us. To what extent will they influence battlefield tactics?

Change of Address

From and after April 1 the editorial and business offices of the COAST ARTILLERY JOURNAL will be located at 1115 Seventeenth Street, N. W., Washington, D. C. After thirty-seven years at Fort Monroe, the JOURNAL leaves that station with reluctance, but business reasons dictate the move. Closer relationship with the other service periodicals, with the office of the Chief of Coast Artillery, and with the Corps seems to have become necessary and to outweigh the advantages of location at Fort Monroe. The JOURNAL trusts that such associations and the greater amount of time and thought which may be devoted to the needs of the Corps will be productive of a better and more interesting periodical. The JOURNAL also trusts that its friends will visit it at its new address whenever they may be in Washington.

There is a phase of military training for our young men, to which attention is especially invited, and that is the benefit to the individual himself. He is taught respect for authority of which there is far too little in our country. He learns self-discipline, hygiene, self-confidence, and has an opportunity to develop qualities of leadership, with an understanding of its responsibilities.—General John J. Pershing.

PROFESSIONAL NOTES

Coat of Arms of the Harbor Defenses of Balboa

Shield: Gules, a chevron *or* semme of hearts of the first between in chief two portcullis of the second and in base an old fashioned cannon paleways of the like garlanded with Santo Espirito orchids proper.

Crest: On a wreath of the colors a dexter arm embowed tatooed on forearm with skull and bones and anchor with blue sleeve rolled up holding a smoking 17th century pistol, all proper.

Motto: Strength, Loyalty, Valor.

The shield is red, the artillery color, and with the gold charges gives the Spanish colors. The name of the first President of Panama and of the principal fort of the defenses, Amador, is indicated by "Canting heraldry" by the red hearts strewn on the yellow chevron. The Coast Artillery is shown by the single heavy gun and the jungle by the twisted garland of Holy Ghost orchids which are said to grow only on the Isthmus. The Isthmus formed the gateway through which poured the treasure of Peru to old Spain, later the wealth of California to the east, and now the commerce of the Atlantic to the Pacific. This gateway is represented heraldically by the portcullis and since the Pacific side has two locks two are used.

The crest recalls the early stormy days on the Isthmus culminating in the sack of old Panama by Sir Henry Morgan. The drawing is from an actual weapon of the period and place.

Modification of 155-MM Rammer

By LIEUT. J. E. REIERSON, C. A. C.

1. The modification of the rammer for the 155-mm. gun as described herein requires an alteration of materiel.

2. Modification:

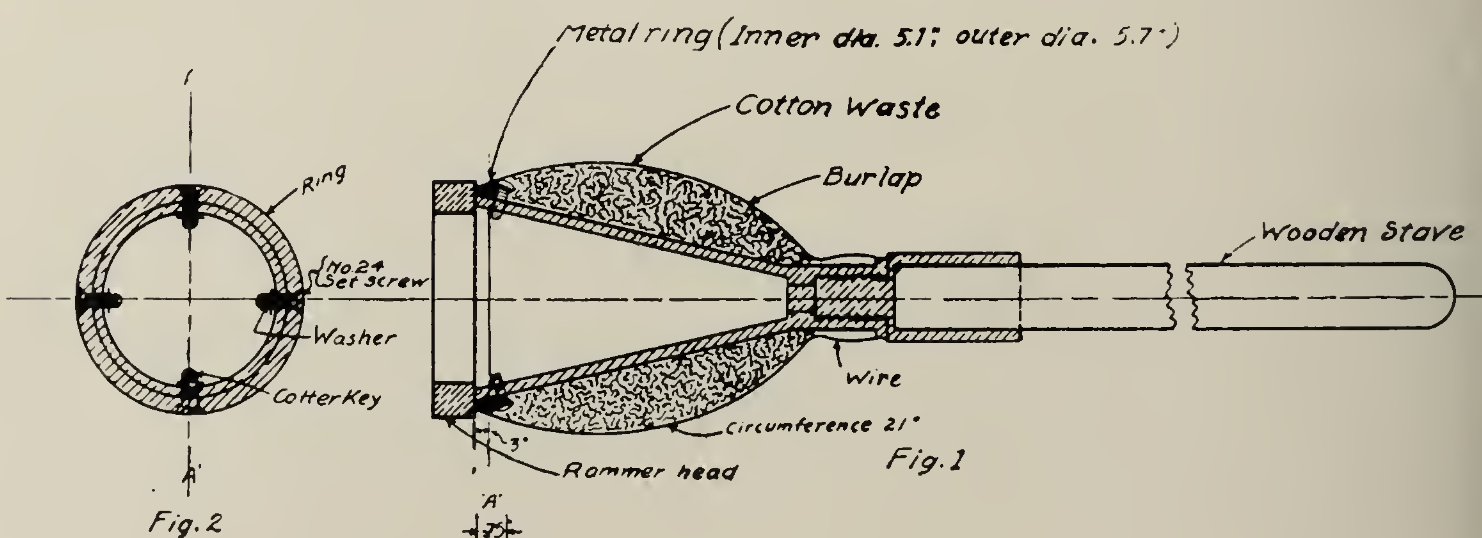


Fig. 2

Fig. 1

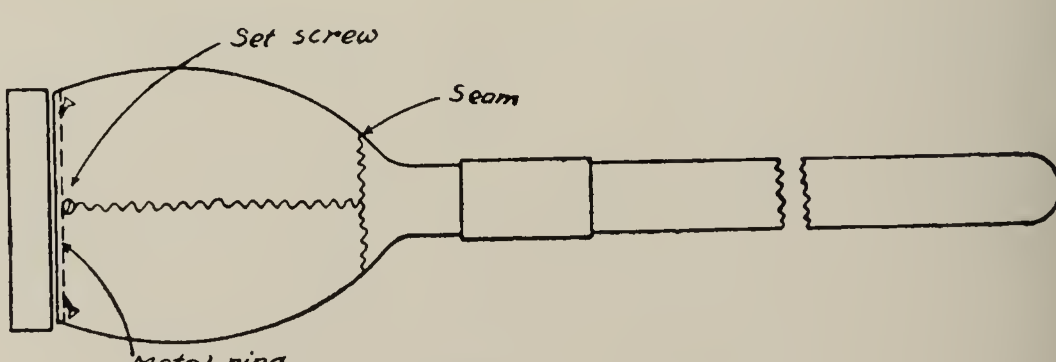


Fig. 3

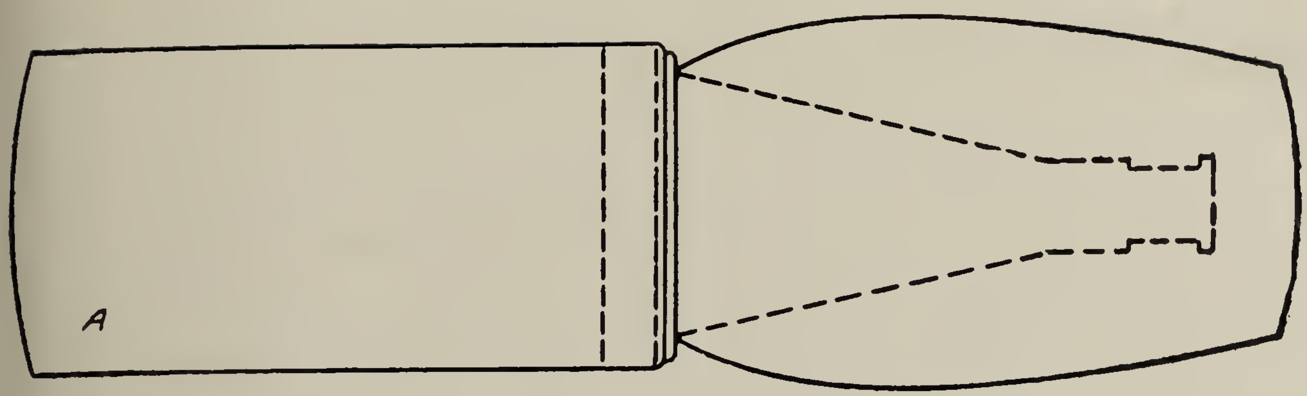


Fig. 4

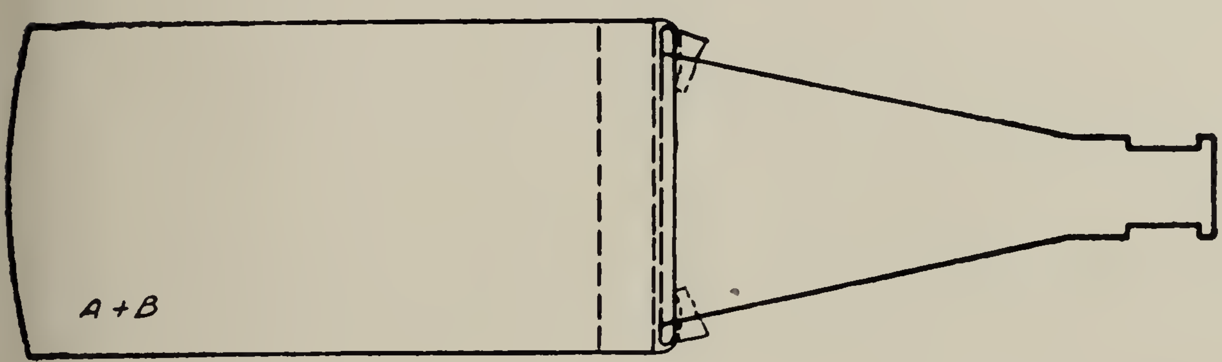


Fig. 5

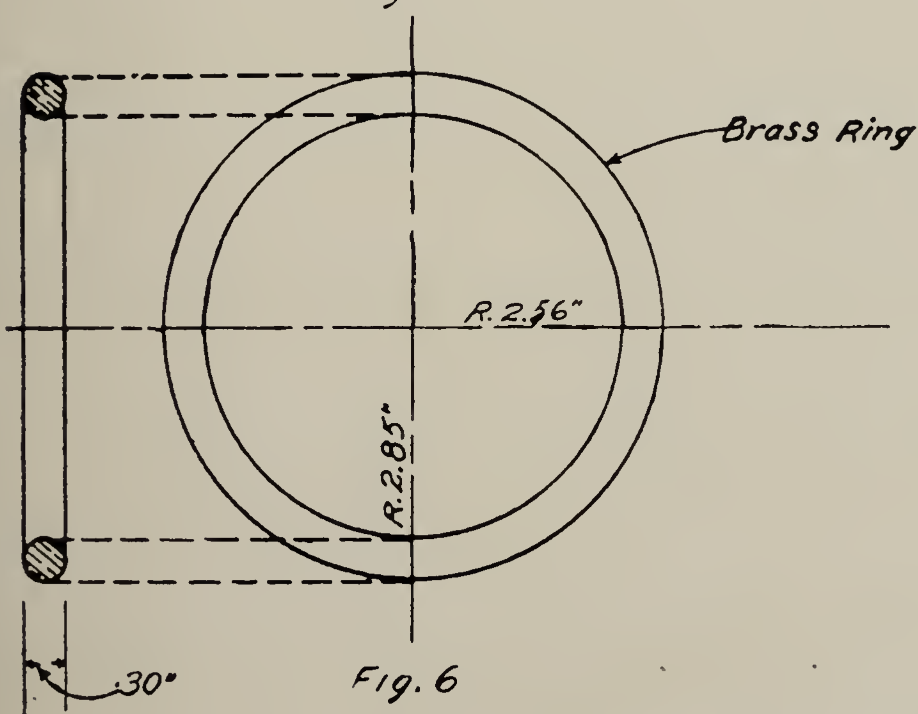


Fig. 6

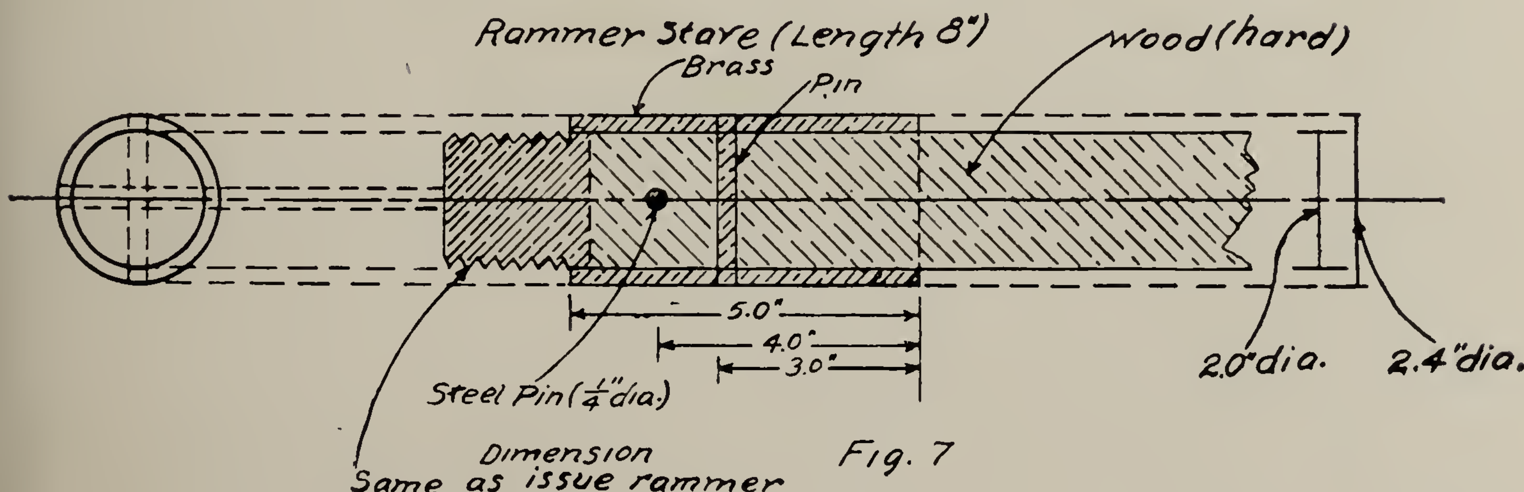


Fig. 7

a. Four holes (equally spaced) are drilled and tapped through the rammer head to receive No. 24 brass flat-head screws.

b. These set screws support a metal (preferably brass) ring through which a double thickness of burlap, 24"x 23", is threaded the long edge parallel to the stave and its mid point approximately ¾ inch in rear of the rim of the rammer head. That half of the burlap (B) in rear of the rammer head is now folded over the rammer head (see figure 4).

3. The ring is now pushed against the rim of the rammer head and the set screws screwed home (figure 5). The ring will now hold the front end of the sponge. The burlap (A and B) is now folded back over the rammer.

4. Cotton waste is now packed inside the burlap and around the rammer. When the sponge is well packed and has a maximum circumference of 21 inches, the seam (parallel to the stave) is sewed.

5. The open end is now wired to the rear of the rammer head. Any burlap in rear of the turns of wire is folded back over the wire and sewed to the rear end of the sponge.

6. The iron stave is replaced with a wooden stave for ease in handling (figure 7).

7. The advantages of this rammer-sponge are:

a. A rammer similar to the above was made by the writer and used by Battery B, 92nd Coast Artillery (PS), in all practices this year and saved on an average of 3 seconds per salvo.

b. The ramming and sponging were as good as if the separate units were used. This was accomplished by using three men on the rammer-sponge. A test made in one practice showed the density of loading to be equal for each trial shot.

c. This rammer-sponge is easier to handle than the rammer as issued, as it weighs 13 pounds less after being dipped in water.

d. It has the advantage over any other rammer-sponge the writer has seen in that it will, with proper care, last at least an entire season. The wear and tear is taken up by the front of the rammer head.

e. It will cost little to modify.

Ballistic Effects Due to the Rotation of the Earth

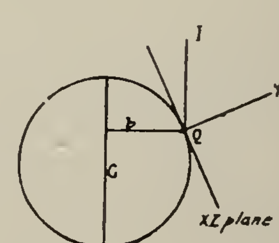
By Henry B. Hedrick, Ph. D.

The transfer of the rotation of the earth to a parallel axis passing through the point O, occupied by the gun, is accomplished by reducing the point O to rest by applying to every point under consideration an acceleration equal and opposite to that of O, namely $\Omega^2 b$ where b is the distance of the point O from the axis of rotation, and also applying a velocity equal and opposite to the initial velocity of O, namely Ωb. The whole figure will then be turning about an axis OI, parallel to the axis of rotation of the earth, with an angular velocity Ω. It is this latter rotation which was resolved by the present writer into the three components Ω_x, Ω_Y, Ω_z, on page X of the introduction to the 1924 Ballistic Tables, namely;

(1) $\Omega_x = \Omega \cos L \cos A$

$\Omega_Y = \Omega \sin L$

$\Omega = \Omega \cos L \sin A$



where

A = Azimuth of the plane of fire

L = Latitude of the position of the gun

Ω_x= Rotation about the X-axis

Ω_Y= Rotation about the Y-axis

Ω_z= Rotation about the Z-axis

The term in acceleration, $\Omega^2 b$, is included in the value of g used, thus in meters

$g = 9.8060\text{-}0.0260 \cos 2L$ (Helmert)

The rotation of the earth on its axis is a simple physical fact and the mathematical formulae for its effect on the flight of a projectile may be developed as follows:

Let u, v, w, be the component velocities in space of a particle whose rectangular coordinates are x, y, z with origin at the gun. The resolved velocities relatively to the moving axes are x', y', z'. To find the motion in space we must add to these the resolved velocities due to the motion of the axes. If we suppose the particle to be rigidly connected with the axes, its velocities would be expressed by $-z\,\Omega_Y + y\,\Omega_z, -x\,\Omega_z + z\,\Omega_x, -y\,\Omega_x + x\,\Omega_Y$. By adding the parts together the actual resolved velocities of the particle will be

(2) $u = x' - z\,\Omega_Y + y\,\Omega_z, v = y' - x\,\Omega_z + z\,\Omega_x, w = z' - y\,\Omega_x + x\,\Omega_Y$

Since acceleration is the rate of increase of velocity just as velocity is the rate of increase of space, it is clear that the relations which hold between accelerations and velocities must be the same as those which hold between velocities and spaces. Thus the relations between the accelerations, X, Y, Z, and u, v, w, follow at once from those between u, v, w, and x, y, z, hence:

(3) $X = u' - w\,\Omega_Y + v\,\Omega_z, Y = v' - u\,\Omega_z + w\,\Omega_x, Z = w' - v\,\Omega_x + u\,\Omega_Y$

From (2) by differentiation we obtain,

(4) $u' = x'' - z'\,\Omega_Y + y'\,\Omega_z, v' = y'' - x'\,\Omega_z + z'\,\Omega_x, w' = z'' - y'\,\Omega_x + x'\,\Omega_Y$

whence (3) becomes

$X = x'' - 2z'\,\Omega_Y + 2\,y'\,\Omega_z$ + terms containing Ω^2

(5) $Y = y'' - 2x'\,\Omega_z + 2\,z'\,\Omega_x$ + terms containing Ω^2

$Z = z'' - 2y'\,\Omega_x + 2\,x'\,\Omega_Y$ + terms containing Ω^2

Without rotating $u = x'$, $v = y'$, $w = z'$

(6) and $X = u' = x''$, $Y = v' = y''$, $Z = w' = z''$

From (5) and (6) and substituting the values of Ω_x, Ω_Y, Ω_z, from (1), given above, the effect of rotation of the earth may be written:

$\delta x'' = -\,2\,y'\,\Omega \cos L \sin A$ + term in z'

$\delta y'' = +\,2\,x'\,\Omega \cos L \sin A$ — term in z'

$\delta z'' = +\,2\,y'\,\Omega \cos L \cos A - 2x'\,\Omega \sin L.$

The Irish Free State Army

It is announced that the Government of the Irish Free State, intent on economy, proposes to make a big reduction in the strength of the Free State Army. The last Army Estimates amounted to £1,800,000. This year there is to be a cut of £300,000. The Army has an active strength at the present time of 736 officers and 7,919 other ranks. During the present year it is to be reduced to a total strength of 5,000. There will be a Class "A" Reserve for those who have served in the Regular Army, and a Class "B" Reserve for those who have had no military service. In addition, there will be a Volunteer Force on the lines of the British Territorial Army. Those enrolled in this force will drill weekly in their own areas, and will be called out for annual training. Among the additions to the equipment of the Army is a tank of Japanese design—which is odd. Special inducements are

offered to officers who are prepared to resign. Those who have served continuously since October 1, 1924, will receive a gratuity calculated on the cash value of the pay and allowances of the rank held (acting or substantive) at the date of the acceptance of the resignation. They will thus be given: (a) Two years' full pay of the rank held at the date of resignation; (b) two years' ration allowance at the rate in force for single officers, and (c) two years' lodging, fuel and light allowance. In the case of a married officer the amount shall be assessed at the rate applicable to married officers. Officers commissioned later than 1924 will receive 61 days' pay at the rate of the rank held on retirement, 61 days' ration allowance and 61 days' lodging, fuel and light allowance. Officers on half-pay are entitled to the gratuities on the same scale as officers on full pay. Officers who retire will be transferred to the Reserve (Class "A"), and officers who resign will sever all connection with the Free State Army.—*The Army, Navy and Air Force Gazette.*

Target Glider Experiments at Wright Field

By A. M. Jacobs

Captain Carl Greene recently acted as observer for Major Gerald E. Brower in a series of flight tests with the target glider and came down declaring that he wouldn't be surprised if Major Brower soon had the thing so docile as to be able to land it at any given point on the speed course from any altitude. The inspiration for such extravagance was the three flights he had just witnessed in which the glider after release had behaved exactly as the Major had foreordained.

The target glider, it will be remembered, is a twelve-foot high-wing monoplane of box-spar construction, carried on the upper wing of a full-sized air plane from which it is released, becoming as it floats out into the air, a target for aerial gunnery or antiaircraft practice. By bending the elevator and tab to certain settings, various angles of descent may be predetermined.

On the aforementioned flight, Major Brower had made the setting for smooth steady flight, and a smooth steady flight had followed until it drifted gently to earth. Next he set it for diving and zooming for 2000 feet from a 3000 foot altitude. It obeyed. But the third demonstration was the one which took Captain Greene's breath. In order to make the glider suitable for naval antiaircraft practice, Major Brower had padded it with kapok to keep it afloat. He made the setting for a stall and a dive from 800 feet. Flying at this altitude, he and Captain Greene proceeded to a small lake about 300 yards wide, situated near Wright Field. At the proper moment he released the glider, which with three oscillations landed squarely in the middle of the water. The floatation feature was successful, as it was still atop when several hours later they went to haul it out.

This glider has proved quite durable, having made more than fifty landings without damage. Major Brower is now developing a metal wing to replace the present wood structure. It is believed this will better retain rigidity than the present type, which becomes "floppy" after numerous landings and cannot be set quite so accurately.—*Air Corps News Letter.*

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. W. E. COLE, *Colonel, Coast Artillery Corps, President, Coast Artillery Board.*

Project No. 678, Test of Sponge-Rammers, T-3, for 155-mm. Gun.—Four Sponge-Rammers for the 155-mm. gun have been manufactured by the Ordnance Department and shipped to Fort Eustis for service test under the supervision of the Coast Artillery Board.

Project No. 679, Ramming Test of Dummy Projectiles, 12″ Gun.—A rear band assembly for 12″ dummy projectile, manufactured by the Ordnance Department, and designed to eliminate sticking of dummy projectile, is being shipped to Fort Monroe. This assembly has been given a test at Fort Hancock, but before standardizing the design, a further test of at least 100 ramming will be conducting under the supervision of the Coast Artillery Board.

Project No. 680, Experimental Antiaircraft Observation Device.—This instrument was developed at Fort H. G. Wright and later tested at Aberdeen Proving Ground in connection with the firings and tests of the 62d Coast Artillery. The Coast Artillery Board has made a study of this device in comparison with the Camera Spotting Unit.

Project No. 681, Test of Fast Towing Target (Navy Design).—This target, constructed by the Navy Department, is designed to be towed by a destroyer at a speed of 25 to 30 knots. Preliminary towing tests are scheduled for the month of February.

Project No. 682, Firing Lanyard for 3″ Antiaircraft Gun, M1917.—Firing lanyards similar to those at present employed on the 3″ A. A. Gun M1917 MI are recommended for installation on the 3″ A. A. Gun M1917. As fuze setters are to be installed on the left hand side of the gun, the piece will be fired from the right hand side, and a guide will be placed near the breech to permit this being done.

Project No. 683, Replacement of Standard Motor Vehicles by Commercial Types.—Increased demands for motor vehicles as replacement require a careful study to determine the most logical types of commercial vehicles to be used and special kinds which must be developed. The Coast Artillery Board is making a study of the special vehicles required for the Coast Artillery Corps.

Project No. 684, Marine Smoke Bombs and Float Boxes.—The question has been brought up several times as to whether or not any military requirement existed for marine smoke bombs and float boxes which were developed during the War for use by the Navy. The Coast Artillery Board has this question under study.

Project No. 685, Employment of Star Shells for Antiaircraft Firing.—The possibility of employing one of the four guns of an antiaircraft gun battery to fire star shells for the purpose of illuminating the target sufficiently to allow the fire control section to pick up same and fire upon it with the other guns of the battery has been suggested. Development of the idea has been recommended.

Project No. 686, Test of Flashlights.—Four flashlights of various types have been sent to the Coast Artillery Board for test with a view to determining whether or not one of them can be regarded as satisfactory for adoption as standard for issue to the Coast Artillery in place of the present Signal Corps type TL-95 flashlight, and such other miscellaneous flashlights as are now in the hands of troops. The flashlight shave been turned over to the 52d Coast Artillery (Ry) for service test.

A TABULATION OF CHARTS AND SCALES FOR EXISTING SEA COAST ARMAMENT.

These charts and scales are prepared by the Coast Artillery Board under the direction of the Chief of Coast Artillery, for issue to the service.

Caliber	Model	Projectile, Weight, Lbs.	Muzzle Velocity, F. S.	Range Cor. Boards: Percentage Range Correction Charts	Deflection Boards, Charts: Mortar, Model 1906	Deflection Boards, Charts: C. A. B. Universal	Deflection Boards, Charts: T2 Stephens	Deflection Boards, Scale Az., C. A. B. Univ.: Degrees	Deflection Boards, Scale Az., C. A. B. Univ.: Mils	Percentage Corrector, Range-Range Relation Scales: Standard	Percentage Corrector, Range-Range Relation Scales: Non-Standard	Percentage Corrector, Range-Range Relation Scales: Non-Standard	Percentage Corrector: Range Scales, Yards	Percentage Corrector: Range Ele. Scales, Deg.	Percentage Corrector: Range Ele. Scales, Mils.	Interpolator Scales: Range Scales, Yards	Interpolator Scales: Elevation Scales, Deg.	Interpolator Scales: Elevation Scales, Mils
37-mm	Sub-Caliber for 155-mm Gun	1.097	1312	R	NR	R	R	NR	R	NR	NR	NR	NR	NR	R	NR	NR	R
1.457	Sub-Cal. for 6″-8″-10″-12″-14″ Guns	1.1	2000	R	NR	R	R	R	NR	NR	NR	NR	R	NR	NR	R	NR	NR
75-mm	Sub-Caliber for 12″ Mortars	18.0	Zone	R	R	R	R	R	NR	NR	NR	NR	NR	R	NR	NR	R	NR
75-mm	Ex-Cal. for 14″ RR-16″ and 16″ How	15.96	1693	R	NR	R	R	R	NR	NR	NR	NR	NR	R	NR	R	R	NR
6″	1897MI, 1908, 1908MI, 1908MII	108	2600	R	NR	R	R	R	NR	108	90	NR	R	NR	NR	R	NR	NR
6″	1897MI, 1908, 1908MI, 1908MII	90	2700	R	NR	R	R	R	NR	90	108	NR	R	NR	NR	R	NR	NR
6″	1900, 1903, 1905	90	2600	R	NR	R	R	R	NR	90	108	NR	R	NR	NR	R	NR	NR
6″	1900, 1903, 1905	90	1950	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
155-mm	1918, Filloux	95	1955	R	NR	R	R	NR	R	NR	NR	NR	NR	NR	R	NR	NR	R
155-mm	1918, Filloux	95	2410	R	NR	R	R	NR	R	NR	NR	NR	NR	NR	R	NR	NR	R
8″	1888, 1888MI, 1888MII	200	1950	R	NR	R	R	R	NR	200	323	NR	R	R	NR	R	R	NR
8″	1888, 1888MI, 1888MII	200	2600	R	NR	R	R	R	NR	200	323	NR	R	R	NR	R	R	NR
8″	1888, 1888MI, 1888MII	323	2200	R	NR	R	R	R	NR	324	200	NR	R	R	NR	R	R	NR
10″	1888, 1888MI, 1888MII, 1895	510	1800	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10″	1888, 1888MI, 1888MII, 1895	510	2400	R	NR	R	R	R	NR	510	617	NR	R	NR	NR	R	NR	NR
10″	1888, 1888MI, 1888MII, 1895	617	2250	R	NR	R	R	R	NR	617	510	NR	R	NR	NR	R	NR	NR
240-mm	Howitzer, (Schneider) 1918MI	345	Zone	R	*	*	*	*	*	NR	NR	NR	*	R	*	*	*	*
12″	1895, 1895 MI	900	2325	R	NR	R	R	R	NR	900*	975*	1070*	R	NR	NR	R	NR	NR
12″	1895	975	2275	R	NR	R	R	R	NR	975	900	1070*	R	NR	NR	R	NR	NR
12″	1895	1070	2250	R	NR	R	R	R	NR	1070	975	900*	R	NR	NR	R	NR	NR
12″ M	1890, 1890MI, 1908, 1912. (Using Aliquot part charges)	700 824 1046	Zone	R	R	R	R	R	NR	NR	NR	NR	NR	R	NR	NR	R	NR
12″ M	1890, 1890MI, 1908, 1912. (Using Base Increment charges)	700 824 1046	Zone	R	R	R	R	R	NR	NR	NR	NR	NR	R	NR	NR	R	NR
14″	1907, 1907MI	1400	2200	R	NR	R	R	R	NR	1400*	1560*	1660*	R	NR	NR	R	NR	NR
14″	1909, 1910, 1910MI	1400	2400	R	NR	R	R	R	NR	1400	1560*	1660	R	NR	NR	R	NR	NR
14″	1920 MII	1400	2700	R	NR	R	R	R	NR	NR	NR	NR	R	R	NR	R	R	NR
14″	1907, 1907 MI	1560	2170	R	NR	R	R	R	NR	1560	1400	1660	R	NR	NR	R	NR	NR
14″	1909, 1910, 1910MI	1560	2370	R	NR	R	R	R	NR	1560	1400	1660	R	NR	NR	R	NR	NR
14″	1907, 1907 MI	1660	2150	R	NR	R	R	R	NR	1660	1400	1560	R	NR	NR	R	NR	NR
14″	1909, 1910, 1910 MI	1660	2250	R	NR	R	R	R	NR	1660	1400*	1560*	R	NR	NR	R	NR	NR
14″	1909, 1910, 1910 MI	1660	2350	R	NR	R	R	R	NR	1660	1400	1560	R	NR	NR	R	NR	NR
16″	1919, 1919MI, 1919MII	2100	2210	R	NR	R	R	R	NR	NR	NR	NR	R	NR	NR	R	NR	NR
		2100	2470	R	NR	R	R	R	NR	NR	NR	NR	R	NR	NR	R	NR	NR
		2100	2750	R	NR	R	R	R	NR	NR	NR	NR	R	NR	NR	R	NR	NR
16″	1919, 1919MI, 1919MII	2340	2190	R	NR	R	R	R	NR	NR	NR	NR	R	NR	NR	R	NR	NR
		2340	2440	R	NR	R	R	R	NR	NR	NR	NR	R	NR	NR	R	NR	NR
		2340	2700	R	NR	R	R	R	NR	NR	NR	NR	R	NR	NR	R	NR	NR
16″ How.	1920	2100	1350	R	NR	R	R	R	NR	NR	NR	NR	NR	R	NR	NR	R	NR
		2100	1550	R	NR	R	R	R	NR	NR	NR	NR	NR	R	NR	NR	R	NR
		2100	1750	R	NR	R	R	R	NR	NR	NR	NR	NR	R	NR	NR	R	NR
		2100	1950	R	NR	R	R	R	NR	NR	NR	NR	NR	R	NR	NR	R	NR

LEGEND:

R—Ordinarily required and now ready for distribution.
NR—Not ordinarily required but may be supplied if necessary.
*—Not prepared at this time.

The Coast Artillery Board Table,
Fort Monroe, Va.
Jan. 26, 1929

BOOK REVIEWS

The Fundamentals of Military Strategy. By Oliver Prescott Robinson, Lieutenant Colonel, Infantry. Washington: United States Infantry Association. 1928. 5¾"x 8¼". 232 pp. $3.00.

Strategy. By George J. Meyers, Captain, U. S. Navy. Washington: Byron S. Adams. 1928. 5¼"x 7¾". 263 pp. $3.00.

Here are two books on the same subject written one for the Army and one for the Navy. Fundamentally, the principles of strategy are the same on water as on land. The application may differ, the conditions under which the application is made may not be the same, but sound naval strategy is sound military strategy. Either book may therefore be used by either service.

While both books teach much the same doctrine and quote the same authorities, they differ in their method of attack. Captain Meyer handles the subject from the broader viewpoint and omits, in general, discussion of matter which is generally to be found in accepted authorities. Colonel Robinson, seeking to point out fundamentals, discusses strategy more in detail and makes free use of examples. He takes up each of the principles of war in turn, although he prefers to refer to them as ideas, rather than principles, pointing out that doubt may arise as to whether some of them are in truth principles but that there can be no question of them as ideas.

Colonel Robinson's book will have the greater value for the novice in the realm of strategy, and it is accompanied by an extensive bibliographical list which, although not classified, will be very convenient for the military student. Captain Meyers' book will find merit in the eyes of those who are already somewhat familiar with fundamentals. It supplements the more elementary book, and it has a valuable section of suggested reading courses, classified as to subject and subdivided to show particular chapters or pages of the authorities quoted.

Both works are recommended for the military student.

Andrew Jackson: An Epic in Homespun. By Gerald W. Johnson. New York: Minton, Balch and Company. 1927. 6"x 8". 303 p. Il. $3.50.

With the exception of Abraham Lincoln, probably no man who has risen to a high place in American public life owes less to the element of chance or luck than does Andrew Jackson. Born on the wild frontier of an infant nation and reared among the educational disadvantages of the frontier, he rose to power and created for himself a place in history through sheer force of character backed by tremendous natural ability. Direct, determined, forceful, and hypersensitive, handicapped much of the time by ill health, he led a theatrical life in which he generally held the center of the stage. District attorney, Representative in Congress, Senator, Justice of the State Supreme Court, Major General of militia, and Major General in the Regular Army, he seemed unable to escape from a public career. He had early attracted a large following among the public, but his success over Packenham at New Orleans made him a national idol. It being a custom among Americans to reward their popular heroes with public office, the Battle of New Orleans assured Jackson the Presidency.

Although General Jackson can not be ranked great among generals, the military man can find much of benefit in a study of his career. His methods were even more direct

than those of General Grant and had more of personal leadership in them. Mr. Johnson makes no comparisons, but he makes it clear that General Jackson was not instinctively a military leader, as were many of those who rose to fame in the Civil War. He was, however, a born leader of men and he applied the rules of common sense to the problems that confronted him. For this reason he was eminently successful whenever the matter of leadership was involved.

In his book, Mr. Johnson writes sympathetically—perhaps too much so. Jackson was a man of the people, possessed of many faults and many weaknesses. This the author admits but, while attempting no excuses, he argues that it was these very weaknesses that made Jackson great. There being no subtlety in the General's character, he did what he pleased when he pleased, without apology or equivocation, whether it was cock fighting or the establishment of the Spoils System, betting on horse races or the destruction of the National Bank. This, the author points out, the people could understand, and what they could understand they could love. Because Mr. Coolidge is an enigma to them, the people delight in him; because Andrew Jackson had no secrets for them, the people loved him.

Jackson was a great man in a day of great men, and Mr. Johnson's book is worthy of its subject. The narrative is entertaining, the story is nicely proportioned, and the historical background is well sketched in, without being voluminous. This volume earns a place among the best of recent biographical work.

Basic Coast Artillery. Edited by P. S. Bond, J. B. Sweet, and R. Arthur. Annapolis: The National Service Publishing Company. 1928. 6"x 9". 751 p. Il. $3.75.

Advanced Coast Artillery. Edited by R. Arthur and P. S. Bond. Annapolis: The National Service Publishing Company. 1928. 6"x 9". 926 p. $5.00.

Professors of Military Science and Tactics and their assistants have ever been confronted with the difficulties attending the assembly of the necessary instructional texts for the respective R. O. T. C. courses. The lay-out of courses has naturally had its foundation in the instruction necessary to insure the attainment of the required objective, culminating in the basic qualification of the student for commission as second lieutenant in the arm of his choice. A well established standard has always existed as to the required basic qualifications and as to the subjects to be covered as essential to such qualifications, but the instructional texts covering these subjects in a form convenient and complete has been lacking. The assembly of required texts has involved demands on all arms and branches, and in some cases necessitated resort to private purchase of texts not available for issue. Of the great amount of material so selected only a part would be germane to a particular subject of instruction—in some cases a very small part—but the whole must of necessity be accumulated.

The Government has not yet seen fit to remedy this condition, but the enterprise of individuals has stepped into the breach and has provided two text books covering the entire range of subjects of instruction for Basic and Advanced R. O. T. C. Coast Artillery. Since individual enterprise must ever receive its recompense, the cost of these books to student or instructor will serve as an impressive reminder of the great convenience and benefit which will proceed from their possession. It is doubtful, however, that any argument can justify conclusion that the effort required to assemble the similar material from its multifarious sources is not worth $8.75. If another consideration is essential to decision, it is provided in the fact that the material of the two volumes is more complete within the field of the requirements than the similar source material could possibly be. Here is the selected instructional matter which is necessary, largely removed from irrelevant, incidental matter of the same family, and reduced, generally, to the essence of the subject.

The two volumes are complete within their field and accomplish with considerable initial success their purpose in providing only the text material necessary for the required

instruction. That part of the Basic volume covering infantry subjects is especially noteworthy. It covers 424 pages, and is replete with line drawings illustrating movements, postures, proceedures, and methods. The illustrations are carefully prepared and will justify the pains necessary in their preparation in providing visible standards of instruction. The basic material of this entire section is, of course, found in Training Regulations, or other official publications, but it has been amplified and enlarged so commendably that one peruses the text with pleasing interest.

The Basic Coast Artillery Section of the Basic volume is included in 327 pages of text and figures and covers all subjects prescribed for the Basic course. The sources of the material are official publications either of the War Department or of the C. A. School. While this part of the book contains illustrations in ample number of materiel and apparatus, it lacks the wealth of instructional illustration found in the first part. For example, in the sections on service of the piece of the 155-mm. gun and the 3-inch A. A. gun, there are no pictures to illustrate or show the positions, routes, movements, or other duties of cannoneers at any time. The absence of illustrations showing the prescribed standard practices leaves to each individual instructor the necessity for interpreting the written text according to his own light.

The subject matter in this second section is rightfully condensed. It is required that essentials only be given. In an apparent effort to cover the entire field, however briefly, certain material has been included which had better been left out. In the chapter on Telephones there is a paragraph titled "Tactical Employment of Wire Systems." As a subject, this is not pertinent to the instruction of the student in basic coast artillery subjects. It is, in fact, a most advanced and involved subject, and when the text book presumes to cover such a subject in 40 printed lines, the effect is somewhat absurd. The matter which is actually presented under the paragraph heading has to do with general principles underlying the establishment of wire systems, and some random general signal communications doctrine. For example: "a supporting unit is responsible for wire communication from its command post to the command post of the supported unit." It would appear better to have left out all such matter.

The subsequent six paragraphs are in the same category. They list signal agencies and telephone communications pertaining to the artillery brigade, regiment, battalion, battery, AA Sector (which has no official recognition as a tactical element), and AA Battery. The matter presented is of no instructional value by itself, it has no part in basic coast artillery instruction, and had best be omitted.

While the strength of this section of the book would be increased by the elimination of such highly condensed (and extraneous) material, it is not to be inferred that the criticisms offered are major objections. In fact the matter cited is included in about three pages. The general worth of the Coast Artillery Section, as of the Infantry Section, is great. No necessary material is lacking, and it represents standard practices at the time of publication of the book. Improvements of both subject material and the manner of its presentation may be made in subsequent editions. But this may be said of any text book.

The second volume, Advanced Coast Artillery, covers the range of subjects required in the advanced R. O. T. C. courses. As to material it is generally satisfactory; as to arrangement of material it shows some signs of haste in its assembly. One subject follows another without, in some cases, any logical connection or sequence. This may not be an objection, but there are some who will believe that it is in any event a cause for criticism. Military Sketching; Military Law; Rules of Land Warfare; Officers Reserve Corps Regulations; Military History of the U. S.; and Company Administartion follow in order hard on the heels of each other. The essential point, however, is that the essential material which is required is presented in the single volume, and this is much of a recommendation.

It is inevitable that, in the preparation of such works as these, some material must be included which is standard practice only for the time being, which is obsolescent or in the process of becoming so, or which is of such a nature that it is likely to be superseded

at an early date by new developments. But the compiler has only human facilities and intelligence which he may apply, and he accomplishes his work as seems best at the moment. It is probable that, while the basic principles will remain, the detailed proceedures in the solution of the AA gunnery problem will undergo marked changes in the immediate future. So also with respect to the fire control system for seacoast artillery. It remains for the publishers to keep these volumes in step with developments by the publication of supplements from time to time to supersede the obsolescent and obsolete matter. To accomplish their mission to the maximum degree they must present latest standard practices, the entire range of prescribed subjects arranged among themselves, in so far as possible, in logical order; each subject complete to the extent demanded only by requirements of the courses, and the whole stripped of all irrevelant, incidental, or non-essential related matter. The volumes do not wholly conform to this standard, but they probably approach it as nearly as any initial edition of such a work might hope to do.—R. B. B.

Lincoln. By Lucy Foster Madison. Philadelphia: The Penn Publishing Company. 1928. 7"x 10¼". 368 p. Il. $3.50.

Lucy Foster Madison has written a very entertaining story which must not be taken too literally. She dramatizes her account. Her characters converse in colloquial American throughout the book. We learn, for example, what Austin Goelaher, aged eight, and Abe Lincoln, aged six, ate for dinner, where they went to play, and what they said. All very interesting and very, very easy to read. If one likes biography sugar coated, here it is.

The author is an ardent admirer of Lincoln and she writes with a fluent and delicate pen. She brings out strongly his best points and passes lightly over or ignores the stories which are not altogether to his credit. In the essentials she adheres entirely to facts, but she devotes altogether too little space to Lincoln's later years. The emphasis is placed upon his youth, and the period of his Presidency receive but thirty-two pages. Surely Mr. Lincoln's years in the White House were worth more than that.

The typography is excellent, with an open type face, well leaded. Eight extremely good illustrations in color by Frank E. Schoonover are inserted in the text, and the cover is an unusual example of the art of book binding. An entertaining, cleverly written book, beautifully turned out.

Emden: The Story of the Famous Cruiser. By Franz Joseph, Prince of Hohenzollern. London: G. H. Watt. 1928. 5½"x 8½". 293 p. Il. $3.00.

A well told tale of the cruise of the *Emden.* The author, a lieutenant on that ship, writes a straight-forward and personally modest account of her famous raid, for the truth of which he says "I engage my hand and heart." And indeed it rings true, with surprisingly little rancor or boasting. He does, however, point out clearly that there was no necessity for the British to have reopened fire on the wreck of the *Emden* some five hours after she had been run aground, thereby increasing the casualties aboard her. Nor is he at any pains to conceal the fact that the British made no attempt to take the survivors off the *Emden* until some 26 hours after she had been grounded. But he does say frankly that Captain von Müller of the *Emden* attempted to blow up the wreck of his ship long after she had surrendered, and apparently at the further peril of his own men as well as of the English rescuing parties.

The cruise of the *Emden* covered 30,000 miles and lasted more than two months. Besides her bold and successful attacks on Madras and Penang she sank many ships, disrupted British shipping in the Indian Ocean, and forced the employment of many much needed warships in her pursuit. Yet she was a small ship, mounting only 4.1-inch guns, and probably inferior in fighting power to all enemy cruisers in that part of the world, with the possible exception of the Jemtchug which she sank at Penang. She also had a very limited cruising radius. So small was coal-carrying capacity that she was forced to travel

in company with slow colliers almost all the time. Not only had she no coaling ports but she appears to have been unable to get coal from neutrals though she did occasionally coal from colliers in Dutch waters.

In the face of her record it is rather remarkable that the British, in their recent discussion with us on cruiser limitation, should have contended that their 7500-ton cruisers (more than double the size of the *Emden*), mounting 6-inch guns (against the *Emden's* 4.1-inch), and with much greater cruising radius, are defensive and not offensive ships.—S. M.

Now It Can Be Told. By Sir Philip Gibbs. Garden City: Garden City Publishing Co., Inc. 5¼"x 8". 558 p. $1.00.

Father Duffy's Story. By Chaplain Francis P. Duffy. Garden City: Garden City Publishing Co., Inc. 5¼"x 8". 382 p. $1.00.

These two books are too well known to require comment. Father Duffy, as Chaplain of the 165th Infantry, and Sir Philip Gibbs, as newspaper correspondent, went wherever they considered their services to be necessary, regardless of danger to themselves, and they saw many things in many places. The correspondent pictures war; people are incidental to the war. The priest pictures soldiers; the war is incidental to people.

Both books proved their worth when they first appeared, and they are now added to the "Star Series" being brought out by the publishers. In the series are included only books that have a lasting interest. These are printed from the original plates and offered at a popular price so as to bring them within the reach of everyone. Unquestionably the stories of Father Duffy and of Sir Philip Gibbs deserve a place in such a series.

Taschenbuch der Kriegsflotten, 1929. By B. Weyer, Korvettenkapitan A. D. Munich: J. F. Lehmanns Verlag. 1929. 4½"x 6¾". 474 p. Il. 15 marks.

This well known little handbook of the navies of the world again makes its annual appearance. It remains much the same as in former years. A section devoted to a tabular arrangement of the vessels of the various countries, arranged alphabetically, gives dimensions, displacement, draft, speed, armor, armament, and engineering and other data for each class of warship. Following this is a section giving photographs, deck plans, elevations, silhouettes, and certain data of all the principal vessels of each navy. The remainder of the volume gives much miscellaneous information, such as naval developments of the past year throughout the world, tables of comparative naval statistics, national flags, signal codes, conversion tables, etc. An alphabetical index makes the book easy to use.

This is a valuable reference work.

National Defense. Compiled by Julia E. Johnson. New York: The H. W. Wilson Company. 1928. 5¼"x 7½". lxxxiii + 469 p. $2.40.

This is a handbook which consists of selected articles on the subject of national defense. The matter included in the book is recent and thus gives the current thought on the subject. In arrangement, there first appear articles in a general discussion of various phases of national defense. This is followed by two sections, in one of which the arguments are *pro* and in the other of which they are *con.* Many phases are discussed and many authors quoted, of whom we may mention Calvin Coolidge, Richard V. Oulahan, Lynn J. Frazier, C. E. Kilbourne, Carrie Chapman Catt, Edwin M. Borchard, Edwin E. Slosson, John W. Weeks, Charles P. Summerall, Curtis D. Wilbur, Dwight F. Davis, Charles Evans Hughes, Kirby Page, John Dewey, Samuel Gompers, and David Starr Jordan. Military aviation constitutes a separate section of the book.

The book, impartial itself, is of real value and will be of service to anyone interested in the present-day discussions on national policy, national defense, and disarmament.

The Magic Island. By W. B. Seabrook. New York: Harcourt, Brace and Company. 1929. 5¾"x 8½". 336 pp. Il. $3.50.

Haiti is a land of mystery which has been attracting the attention of authors in recent months. Whatever be the phase under investigation, it is natural to attach the word *black* to it. Happily, Mr. Seabrook avoids the obvious and strikes upon a more fortuitous title, one which is fully descriptive of his encounters as any he might have chosen. He found magic in the scenery, in the climate, in the romance, and in the mystery of the island, and he found magic in its stark, ugly realism.

To us, accustomed to the American negro, the terms Voodooism and magic are nearly synonymous. In Haiti, though, so the author found after living for months with and among natives of all classes, the two are not necessarily related. Voodooism he found to be a living religion, into the mysteries of which he was initiated. Sorcery, witchcraft, and black magic he also found, and these subjects take up a considerable part of the volume.

The author includes in his account little which he did not experience himself or hear at first hand. We are therefore left with a feeling that the account is not complete. The first part of the book deals with the Voodoo rites, but we are not certain that he has pictured for us the religion as a whole. The second part takes up black sorcery, but here again we get scarcely more than a glimpse of Haitian magic and the part it plays in Haitian existence. The remaining parts of the volume cover more or less unrelated experiences in Haitian socity and in expeditions about the island—cock fighting, the *danse Congo,* mountain climbing, etc.

The book is interesting—exceedingly so. Whether one is interested in Haiti or not, one will find absorbing everything that Mr. Seabrook has to say—our only criticism being that he did not say enough. The bizarre surroundings, the wierd rites, and the queer beliefs have no counterpart in our country, for our own negroes, emotional and superstitious though they may be, have been so long in contact with white civilization that they have long since forgotten the blood-drinking flesh-eating rituals of their African ancestors. Not the least interesting part of the book are twenty gargoylesque drawings by Alexander King and more than two dozen photographs by the author.

The book will not be easily forgotten, and it is likely to be found for some time among the best sellers.

Great Short Biographies of the World. A Collection of Short Biographies, Literary Portraits, and Memoirs Chosen From the Literatures of the Ancient and Modern World. By Barrett H. Clark. New York: Robert M. McBride and Company. 1928. 6"x 9⅛". 1407 pp. $5.00.

Every once in a while someone has a really good idea, and this is one of them. Strictly speaking, it is a development from another idea, not so valuable, for Mr. Clark has previously prepared collections of great short stories and of great short novels. Biography is of particular interest to the reading public these days and anthologies are appearing with increasing frequency, so it is but natural for the two to be associated. Had Mr. Clark not done so, someone else probably would—and another might not have been so discriminating nor made his book so comprehensive.

It is not easy to find short biographies that are really good. Mr. Clark says: "The ideal biography is a well-written story of a person's life, complete, true, and made by someone who knew him intimately. It contains everything that serves to throw light upon his character, his mind, his person, his work. It is written with passion, affection, imagination, understanding, yet without bias or personal prejudice. This is the sort of biography I have sought, but I have yet to find one that fulfilled all my requirements." Nevertheless, he found forty-nine biographies worthy of a place in his book.

The biographies are arranged in six groups covering the ancient world, medieval Europe, renaissance Europe, seventeenth century Europe, eighteenth century Europe, and

nineteenth century Europe and the United States. Of particular interest to military men are Socrates, by Diogenes Laertius; Alexander the Great, by Plutarch; Augustus Caesar, by Suetonius; Jesus of Nazareth, by Luke; Charlemagne, by Einhard; Jeanne d'Arc, by C. A. Sainte-Beuve; Frederick the Great, by T. B. Macaulay; Napoleon Bonaparte, by George Brandes; and Otto von Bismarck, by Emil Ludwig.

The book contains more than seven hundred thousand words, but through a judicious selection of type and paper it has been kept to a very convenient size. This is the most valuable single volume of biography that has appeared in a long time.

Practical Calculus for Home Study. By C. I. Palmer. New York: McGraw-Hill Book Co. 1929. 4¾"x 7¾". 443 p. Il. $3.00.

A concise and readable book, written in non-mathematical language to serve the needs of those who require the calculus as a working tool rather than as a polite accomplishment. It is equally adapted for a general review of the fundamentals of the science or for reference use by those whose college calculus has become rusty.

Only the most sketchy acquaintence with analytic geometry is assumed, and the author proceeds almost directly to the solution of practical problems by calculus methods. As each new portion of the subject or each new class of applications is taken up, numerous illustrative problems are worked out for the student's guidance. These problems are strikingly varied in origin, serve as excellent models, and help to keep up the heart of the beginner. The separate chapters on maxima and minima and on "rate" problems are of exceptional practical value, both for their general hints and their general availability as model solutions. Excellent discussions are given of the mathematics of simple harmonic motion and of damped vibrations. As the author puts the matter, "The subject of calculus cannot be made *easy*, but it can be made *plain*."

The book is completed by the usual tables. It is very well printed and admirably bound.—F. M. G.

An Outline History of the World. By H. A. Davies, M. A. London: Oxford University Press. 1928. 4¾"x 7¼". 560 p. Il. $2.50.

Every history has to be selective, and none more so than general or world history. Selection having been made, there come the questions of proportion and emphasis. One author will stress the military development of nations, another the economic, and a third the political. Historiography is fascinating, but it certainly is not easy and one's purpose in writing should be very clearly defined before the writing is undertaken.

The author announces his purpose as "primarily an attempt to supply schools with a suitable text-book," but one of interest to the general reader. His interest—and his emphasis—may therefore be arranged in order as political, economic, military, and social. Bearing this in mind, we find the book adequate for its purpose.

Of particular interest to us is the author's chapter on the United States, and here we note particularly the impersonal attitude which is the aim of every writer of history. "Business is undoubtedly the dominant interest of most young Americans. . . . Wealth is not, however, worshipped as an end in itself, but rather as a material proof of success . . . with the business instinct there is mixed a considerable strain of idealism. The American, while he strives to make the best of the world as it is, is also only much alive to the need for a better world. . . . The election of Woodrow Wilson . . . was a triumph for idealism, and his project of a League of Nations . . . received considerable support, but the United States declined to join the League, mainly from business instinct." The "good generalship" of General Washington was an important part in the winning of independence. Generals Grant and Sherman were "leaders of the first rank." Lincoln, "if it were possible, came out of the civil war a better man than he was when he entered it."

The book compresses much information in a small space.

Automobile Blue Book, Volumes IV and V. Chicago: Automobile Blue Books, Incorporated. 1928-29. 7¾"x 9½". Il. Maps. $1.00 per volume.

The two volumes cover approximately the following territory: Vol. 4: South from St. Louis—Washington to Baton Rouge—Jacksonville; Vol. 5: South from Baton Rouge—Jacksonville to the Gulf Coast.

The section covered by each volume is shown by a key map on front end-papers, which is subdivided into quadrangles, each indicating a page number on which is found an enlarged map of that section. These larger maps show roads and their conditions, State and U. S. highway numbers, mileage, etc., and the facing page gives Points of Interest, Recommended Accomodations, City Maps, and suggested routes.

The maps are clear and legible, so that "he who rides may read," and the city maps have the main thoroughfares marked so that one is not put to the necessity of asking information on the street.

A very complete index covers location of every town in each volume. The binding is flexible leatherette, and a very convenient edge marking is used, enabling quick reference to any desired map.

The two volumes mentioned are now available, and it is understood that the remaining seven volumes will be issued during the coming Spring. They will be of great value to anyone who contemplates any tour through unfamiliar territory.—W. R. S.

The Tragic Empress. By George Maurice Paléologue. New York: Harper and Brothers. 1928. 264 p. Il. $3.50.

This book bears the descriptive subtitle of "A Record of Intimate Talks With the Empress Eugenia—1901-1919."

M. Paléologue has the greatest admiration and sympathy for that pathetic old woman who, after the loss of her throne, her husband, and her son, used to wander about Europe, as she herself said, like "An old fluttering bat." Also he impresses on the reader her remarkable memory and keen intellect. That she was sincere and frank—at times even brutally so—is quite apparent from all that Paléologue quotes her as saying.

So through the pen of this French Ambassador and Academician the Empress Eugenia presents her case without equivocation. And it is an extraordinary one. In these days it is hard to realize that dynastic glory should have been so powerful a factor in a woman who died but a few years ago.

But, while M. Paléologue presents the Empress' case in all fairness and generally in her own words, his gallic logic forces him sometimes to insert a heavy rebuttal. One gets in this book the interplay of argument and the contrast between the second Empire and the Third Republic.

On Napoleon III's antagonism towards us the Empress was quite clear: "She then reminded me of how, even from 1846, the prisoner of Ham [later Naploeon] had dreamed of setting up in Central America a strong Latin Empire, which would have barred the road against the ambitions of the United States. It was on Nicaragua that he put his first choice, by reason of the facilities he would there have found for piercing a canal between the two oceans. So he had been quick to see the opportunities of a French intervention in Mexico, on the day that Juarez's dictatorship again released revolutionary passions, which at the same time the War of Secession was getting the two harbors of the great neighboring republic against each other for so long a time." And Eugenia herself, in 1861, gave Napoleon's Mexican Adventure "the final and decisive impulse."

M. Paléologue sums up the character of Napoleon in two sentences: "The dreamer of the Tuileries was just then [1855] wavering between the immediate realities of the Austrian alliance and the misty enticements of the Italian mirage. All his counselors were pushing him towards the alliance; but his fantastic imagination could never resist the allurements of a mirage."—S. M.

Whither Mankind: A Panorama of Modern Civilization. Edited by Charles A. Beard. New York: Longmans, Green and Co. 1928. 408 p. Il. $3.00.

This is a remarkable collection of fourteen articles on various aspects of modern civilization, written by such well-known men as Bertrand Russell, Emil Ludwig, Havelock Ellis, John Dewey and Carl Van Doren. It is, in general, a justification of civilization in the machine age and a prophecy of optimism. Difficulties and dangers are boldly set forth, the fact-finding method of science is employed, but the general tone of the book will please the boosting Babbit rather than the carping critic.

Perhaps the most remarkable article is the first, on the civilization of the East and the West, by the Chinese savant Hu Shih. He boldly debunks the old theory that the East is spiritual and the West materialistic, and argues that the reverse is true. Professor Beard's introduction and final summary are excellent.

Emil Ludwig on "War and Peace" and George A. Dorsey on "Race and Civilization" are rather weak. Ludwig takes up most of his space in combatting the arguments of an undefined class whom he calls "the friends of war"—tilting at wind-mills—and arrives at nothing better than this—"If we give our boys tin soldiers . . . teach them the glory of a uniform . . . the prestige of the State . . . the superiority of the fatherland . . . they will seek to attain the goal which has been pointed out to them as the ideal." Dorsey uses most of his pages in a rather spiteful and petty attack on the opposing school of biologists, the believers in race inheritance such as Osborn, Grant, East, Huntington and McDougall, and in the end gives us this charming bit of inter-racialism—"The Savage is a rational being, morally sound, and in every respect worthy of a place in the Universal Brotherhood of Man." For "Savages read Hottentots, Sicilians, Mexicans, Greeks, Jews, Choctaws, and I am still in complete accord." Whereupon the rest of us might sing that well known old song about the Little Brown Brother.

But aside from these two articles the book is excellent, and furnishes another example of the selective discrimination of the Book-of-the-Month Club.—S. M.

The Story of the Gypsies. By Konrad Bercovici. New York: Cosmopolitan Book Corporation. 1928. 294 p. $4.00.

This book is really a collection of notes on the strange people, the Gypsies. Bercovici himself is a Roumanian. His childhood seems to have been passed in close contact with Gypsies, and he has wondered all over the World studying them.

He thinks they were originally Jats, of the Sudra (the lowest) caste in India. These people were enslaved by the early Hindu conquerors, and gradually filtered out into western Asia and Europe. This infiltration began, probably, at a very early date and has continued up until fairly recent times. The great European center of the Gypsies seems to have been Macedonia, perhaps through the Asiatic conquests of Alexander. From this center as a breeding ground they have spread west throughout Europe and America (the United States and Brazil).

Bercovici sees in them an entirely different conception of civilization from that of the rest of the World. The Gypsies have no words for "possession" or "duty." Their controlling passion is for freedom in its broadest sense, unabridged by possessions or by duties to any state or community. Their marriage vows, for instance, specifically bind a couple only so long as love lasts. As Bercovici puts it, their "Ancestors were of the last of those who lost their wings. The gypsy is still practically in the bird stage."

The driving power behind this intense centrifugal spirit seems to be a very strong superiority complex. The gypsy not only rejects our conception of a settled civilization, based on possessions and duties, but believes himself to be superior to it and to us. This, coupled with his extraordinary cult of the dead (his dead), has enabled him to survive in

all lands, in spite of almost incredible persecution he has everywhere encountered. In fact Bercovici claims that the more he has been persecuted the more persistently he has infiltrated.

In agricultural countries especially the Gypsies have prospered, due to their innate genius for work in metals, for home trading and for entertainment. They have conformed to local prejudices only so far as has been necessary to maintain their happy freedom. And always and everywhere they are a happy people.

Having no religion of their own, they have adopted the outward forms of the religion of the country they happened to be in. It is an extraordinary fact that no gypsy is known to have been killed by the Inquisition.

And yet, in spite of all these traits which keep them a people apart from all others, the Gypsies in every land have succumbed to a certain extent to the influence of the national life surrounding them. Their environment has changed them so that they differ greatly, the Spanish from the Roumanian, the English from the Hungarian. Bercovici thinks that they can best be studied here in America, since we have attracted all kinds; and, were it not for our immigration laws, we would probably end by having the whole lot.

The book is interesting, because of its strange subject. The gypsy legends and proverbs are particularly to the point. But it is curiously jumbled—a book of many repetitions, of sudden breaks and starts, a hodge-podge of ideas and suggestions rather like the Gypsies themselves.—S. M.

The Story of Oriental Philosophy. By Lily Adams Beck (E. Barrington). New York: Cosmopolitan Book Corporation. 1928. 429 p. Il. $5.00.

Whether she writes under the name of Beck or Barrington, whether it is Eastern mysticism or Western biography, her books are well worth reading. This one gives an excellent summary of Indian and Chinese religious philosophy, with short chapters on Persian Sufism and Japanese Shintoism. It is not philosophy in the ordinarily accepted Western sense, but rather religious theology on which she writes. But in studying the various theologies of the Orient, Mrs. Beck is attempting to get down to the foundations of Eastern thought. She sets herself a very great task, and she accomplishes it in a simple, straightforward way, quoting liberally from original sources and interpreting them into plain English.

One half of the book is given over to Indian "philosophy." Mrs. Beck is much impressed by the mysticism of the Vedas and the basic conception of Brahmanism and Buddhim. She devotes several chapters to the life and teachings of the Buddha, condensed from her previous book, "The Splendor of Asia."—S. M.

Sceptical Essays. By Bertrand Russell. New York: W. W. Norton and Company, Inc. 1928. 256 p. $2.50.

Possible Worlds. By J. B. S. Haldane. New York: Harper and Brothers. 1928. 305 p. $2.50.

Both of these books are collections of random essays written for the layman in layman language. Both deal with various aspects of the philosophy of modern science. Both are written in the scientific spirit of scepticism and, curiously enough, both suggest grave doubts as to the logical foundation of science itself. Russell even goes so far as to suggest that the present doctrine of pure science may become nullified by the inability of scientists to accept its logic.

Both of these books are interesting and stimulating.—S. M.

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THE COAST ARTILLERY JOURNAL

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The Corps Antiaircraft Artillery Regiment

By MAJOR JOSEPH C. HAW, C. A. C.

Second Prize, Annual Essay Contest

A knowledge of the tactical employment of the Corps Antiaircraft Artillery Regiment and of its interior functioning constitutes the best foundation for an antiaircraft artilleryman's tactical education. Since the Corps is the smallest subdivision of the mobile army to contain an organization devoted solely to antiaircraft work, it follows that that organization—the Corps Regiment—will necessarily maneuver a great deal more than will the antiaircraft regiments of higher echelons. The latter regiments do not move so frequently, nor are they often confronted with the task of covering combat elements in deployed formation.

The fact that the Corps Regiment is generally regarded as the tactical school of the antiaircraft artillery service is demonstrated by the general use, in the COAST ARTILLERY JOURNAL and in troop schools, of problems involving such a regiment. But many officers who have been, or who will be, confronted with such problems have had little or no experience with such a regiment.

The purpose of this paper is to present a brief and elementary, but comprehensive, view of the regiment and its organization, supply, and interior tactical functioning. There is no single text extant which covers the field; and there are many points that can be learned only by practical experience. First worked up as a lecture for Reserve Officers, nearly two years ago, this study has been carefully revised in the light of over two and a half years of experience in an antiaircraft regiment at peace strength, including three summers of field maneuvers and the training of seven regiments of Reserve Officers. It is believed that anyone who has a good grasp of the points covered will be able to undertake intelligently the solution of map problems or the conduct of field maneuvers involving the Corps Antiaircraft Artillery Regiment or its subordinate units.

Before one can understand the tactical employment of the Corps Regiment, it is necessary to acquire a general working knowledge of the organization and tactics of the Army Corps which the regiment is required to protect. Since battery officers have but little opportunity to gain this information, it is advisable to present a brief discussion of the subject.

THE AMERICAN ARMY CORPS

The normal American Corps consists of Corps troops and three infantry divisions. However, the number of divisions may vary.

Corps troops (War strength) consist of:

(a) Corps Special Troops (Headquarters Company, Military Police Battalion, Signal Battalion, Ordnance Companies, Field Remount Depot, Service Battalion).

(b) Corps Artillery.

(1) One antiaircraft regiment.

(2) One artillery brigade (one 155-mm. gun regiment, three 155-mm. howitzer regiments, one ammunition train of 168 trucks, one observation flash battalion).

(c) Corps Engineer Service.

(d) Corps Medical Service.

(e) Corps Air Service (32 observation planes, 4 observation balloons).

(f) Corps Train.

(1) Motor transport (486 1½-ton trucks; 162 3-ton trucks).

(2) Wagon train (270 wagons).

(g) The Corps complete consists of 83,949 men and officers, 22,595 animals, 240 field guns; and on a single road it would be 151.7 miles long.

(h) Corps Troops consist of 23,859 men and officers, 1730 animals, 96 field guns; and on a single road it would occupy 67.4 miles of road space.

The war strength Infantry Division consists of:

(a) Special troops.

(b) Two infantry brigades (two regiments of three battalions each).

(c) One artillery brigade (an ammunition train and two regiments of two battalions each, 75-mm. guns).

(d) One engineer regiment.

(e) Division Air Service (13 observation planes).

(f) One medical regiment.

(g) Division Train.

(1) 108 1½-ton trucks.

(2) 124 wagons.

(h) The Infantry Division contains 19,993 men, 6929 animals, 48 field guns; and on a single road it would be 28.1 miles long.

DISPOSITIONS OF A DIVISION DEPLOYED FOR ATTACK

The elements in contact with the enemy are the combat elements of the division. Hence, divisional dispositions must be understood if one is to dispose the antiaircraft artillery effectively.

Infantry and field artillery elements are provided with machine guns so mounted as to facilitate fire upon low-flying aircraft.

Both in attack and defense, the infantry is disposed in depth. From the

platoon up, every unit (unless it is assigned an excessive frontage) holds out a support or reserve which it places in its rear.

The locations of reserves, artillery, and administrative and supply establishments depend upon the situation, the road net, and the terrain. There can be no standard distances or intervals; however, one of the governing factors is the range of various weapons. Thus, the light artillery is rarely closer than 1500 yards to our own front line, because if it were closer it would be under fire from enemy machine guns, whose effective range is about 2500 yards. Again, field trains are rarely closer than 5000 to 6000 yards to our own front lines, as this would bring them under fire from enemy light artillery, whose effective range is about 7500 yards.

Figure 1 shows a possible layout of a division deployed for an attack. This diagram is not to scale and is somewhat distorted. Elements of infantry units lower than brigades are not shown; but the diagram does show all the principal establishments of a division so deployed. However, the distances from the front of the various elements will vary in different situations, and even their relative positions will vary. Thus, distributing points for Class I supplies may be in advance of a field train bivouac; the railhead and the landing field may be forward of the division rear boundary. On the other hand, elements shown well forward are always ahead of those shown well back, and vice versa; thus, trains are always parked well in rear of the artillery, while distributing points for ammunition are always in front of distributing points for Class I supplies. The following brief discussion of the elements shown in Figure 1 will give some idea of where they are likely to be located and, what is more important for us, of the antiaircraft protection which they need:

Advanced infantry elements are deployed and offer poor targets to aviators.

Infantry reserves will conceal themselves in woods, cornfields, etc., whenever cover is available.

The artillery is not so easily concealed but will generally use camouflage. It is generally 1500 to 3000 yards from the front line.

At the infantry ammunition distributing points, wagons or trucks of the division train, coming from the rear, transfer their loads to infantry combat trains. They are usually located one to two miles in rear of the line. They are small establishments.

Artillery ammunition distributing points serve the same purposes for the artillery and are likewise generally of small extent.

Command posts of units smaller than a division are but small establishments and are generally concealed.

At distributing points for Class I supplies, the division train transfers rations, gasoline, and oil to field trains. There are more vehicles, men, and supplies likely to be congregated here than at ammunition distributing points. On the other hand, the transfer of loads is sometimes made by night. They are often located just in rear of field train bivouacs.

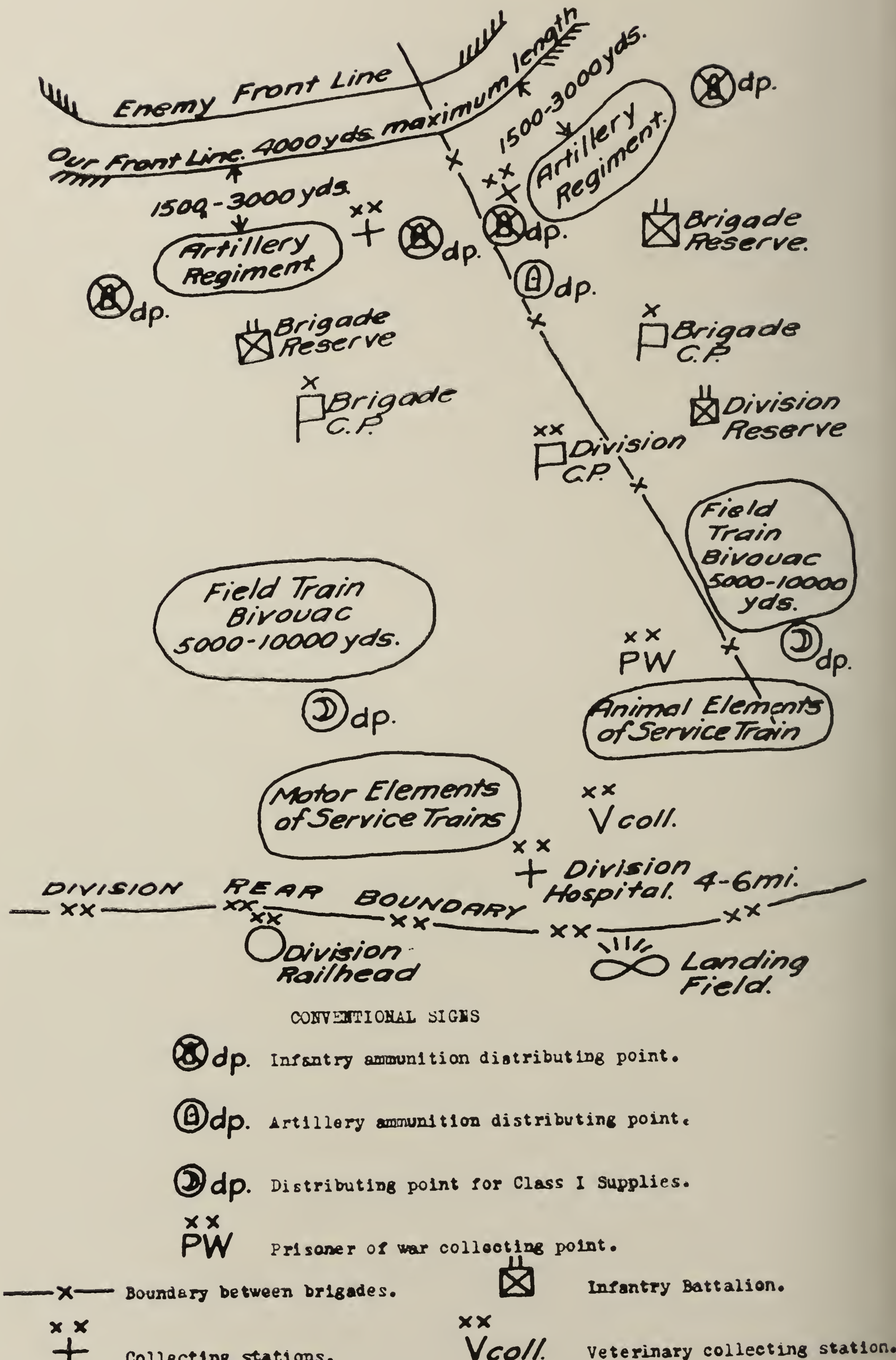


Fig. 1. Possible Dispositions of a Division Deployed for Attack

The collecting points for wounded are usually one to two miles in rear of the line. At these points, ambulances pick up the wounded for evacuation to the division hospital. They are relatively small establishments.

Wounded and sick animals are assembled at the veterinary collecting station. It is located near the bulk of the animals (therefore near the artillery or trains).

The principle of economy of force will probably prevent our furnishing close protection to prisoner-of-war collecting points.

The large number of vehicles and animals grouped in field and service train bivouacs make them conspicuous and highly vulnerable.

At the railhead, the division service trains procure supplies. At certain times there are likely to be many railway cars, stores, men, animals, and vehicles at railheads.

The landing field is likely to be attacked by enemy aviators and should be protected when practicable. (Tables of Organization, 71W, Sept. 8, 1924, show 3 antiaircraft guns in the organic equipment of the division air service. This number is probably not sufficient for adequate protection.)

The division hospital is protected by the laws of war.

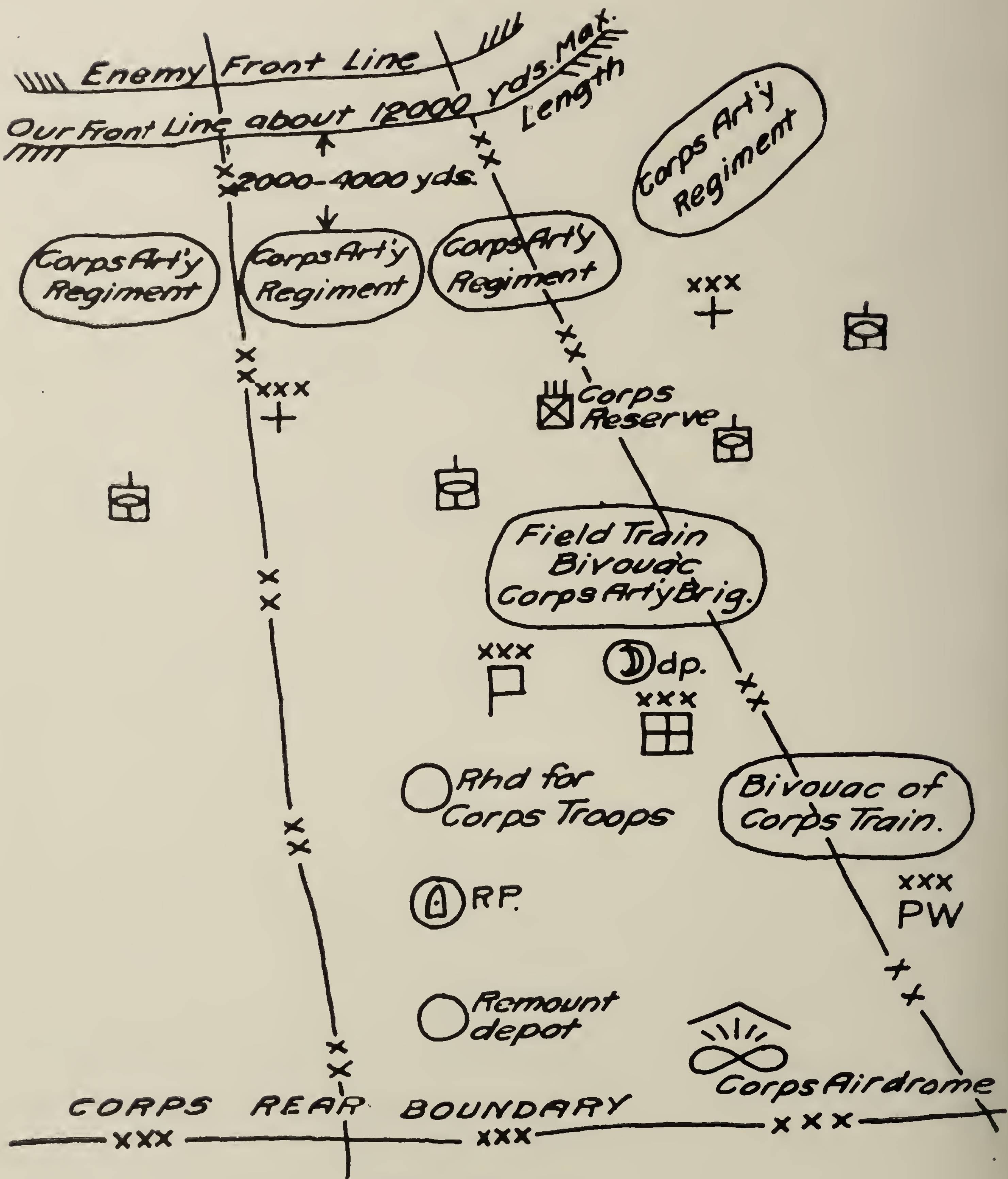
The boundaries between brigades, regiments, etc., are imaginary lines to delineate zones of action. The division rear boundary marks the limit of traffic control by the division.

DISPOSITION OF A CORPS DEPLOYED FOR ATTACK

The maximum frontage of a division in a main attack is generally considered to be 4000 yards. The frontage occupied by a corps will depend upon the number of divisions it places in the line and the nature of the mission assigned —whether a main attack or a holding attack.

Figure 2 shows a corps deployed for attack with three divisions in line. This figure is not to scale and is distorted. No divisional troops or establishments are shown. Each division, however, actually has all the troops and establishments shown in Figure 1, except that frequently the division air service operates from the corps airdrome, so that the division landing field becomes of less importance. Figure 2 does not show a standard arrangement of the relative positions of troops and establishments, for there is no standard arrangement; and the relative positions and distances from the front of corps troops and establishments are subject to a great deal more variation than are those of divisional elements. No elements of the Corps Antiaircraft Artillery Regiment are shown in Figure 2.

While Figure 2 shows the principal establishments of corps troops, there are a number of small elements, usually located at widely separated points, which are not shown. These are: field train bivouacs of Corps Special Troops, Corps Engineer Service, Corps Antiaircraft Regiment, Corps Medical Service, and Corps Air Service; rear echelon of the Corps Command Post; parks for Engineer, Ordnance, Signal, and Chemical Warfare supplies; bivouac of Corps



CONVENTIONAL SIGNS

Collecting point for Corps Troops.

dp. Distributing point for Class 1 Supplies.

PW Corps Prisoner of War Cage.

Infantry Regiment.

Balloon Company.

Command Post Corps

Hospital for Corps Troops

RP Ammunition refilling point

Boundaries between divisions

Fig. 2. Possible Dispositions of a Corps Deployed for Attack

Artillery Brigade ammunition train; and the bivouacs of Corps Special Troops (the elements of which are rarely grouped together for an attack) and Corps Engineer troops.

The following points are important in considering the elements shown in Figure 2:

The corps artillery has its own antiaircraft machine guns for close defense.

Though no official statement on the subject is available to the writer, it is believed that balloon companies and the corps air service also possess antiaircraft machine guns of their own.

The collecting points are for evacuation of corps troops to the hospital for corps troops. Normally, the Corps Medical Service plays no part in evacuation of wounded from the divisions; the army evacuates directly from division hospitals.

The corps infantry reserve is taken from one of the divisions and has the usual infantry machine guns equipped for fire on airplanes.

The field trains of the Corps Artillery Brigade are not necessarily grouped together.

The hospital station for corps troops is about the size of a division hospital station.

Distributing points for corps troops are similiar to those established by divisions. There are usually no distributing points for corps artillery ammunition, as the Corps Artillery Brigade Ammunition Train, which is motorized, generally draws from the refilling point and delivers to battery positions.

It is rarely practicable to give protection to the corps prisoner-of-war cage.

The railhead for corps troops is similiar in size and function to that for a division.

The refilling point for artillery ammunition issues to the ammunition trains of divisions and the corps. It is therefore a relatively large and busy establishment.

The remount depot contains about 400 animals. It can rarely be given machine-gun protection.

Divisional air corps units often operate from the corps airdrome. This airdrome is very likely to be attacked by enemy aircraft.

The Corps Air Service, as stated, is believed to possess some antiaircraft machine guns for the protection of the airdrome. When practicable, however, the corps airdrome should receive gun protection and be allotted additional machine guns.

The Corps Train is not always grouped together; indeed, animal and motor elements are often separated, and still smaller subdivisions are often widely separated. The Corps Train is a huge organization, offering a conspicuous and highly vulnerable target.

DISPOSITIONS OF THE CORPS ON THE DEFENSIVE

Figure 3 shows a front-line regiment, part of a division, disposed for defense. Each front-line division has all its front-line regiments disposed in a

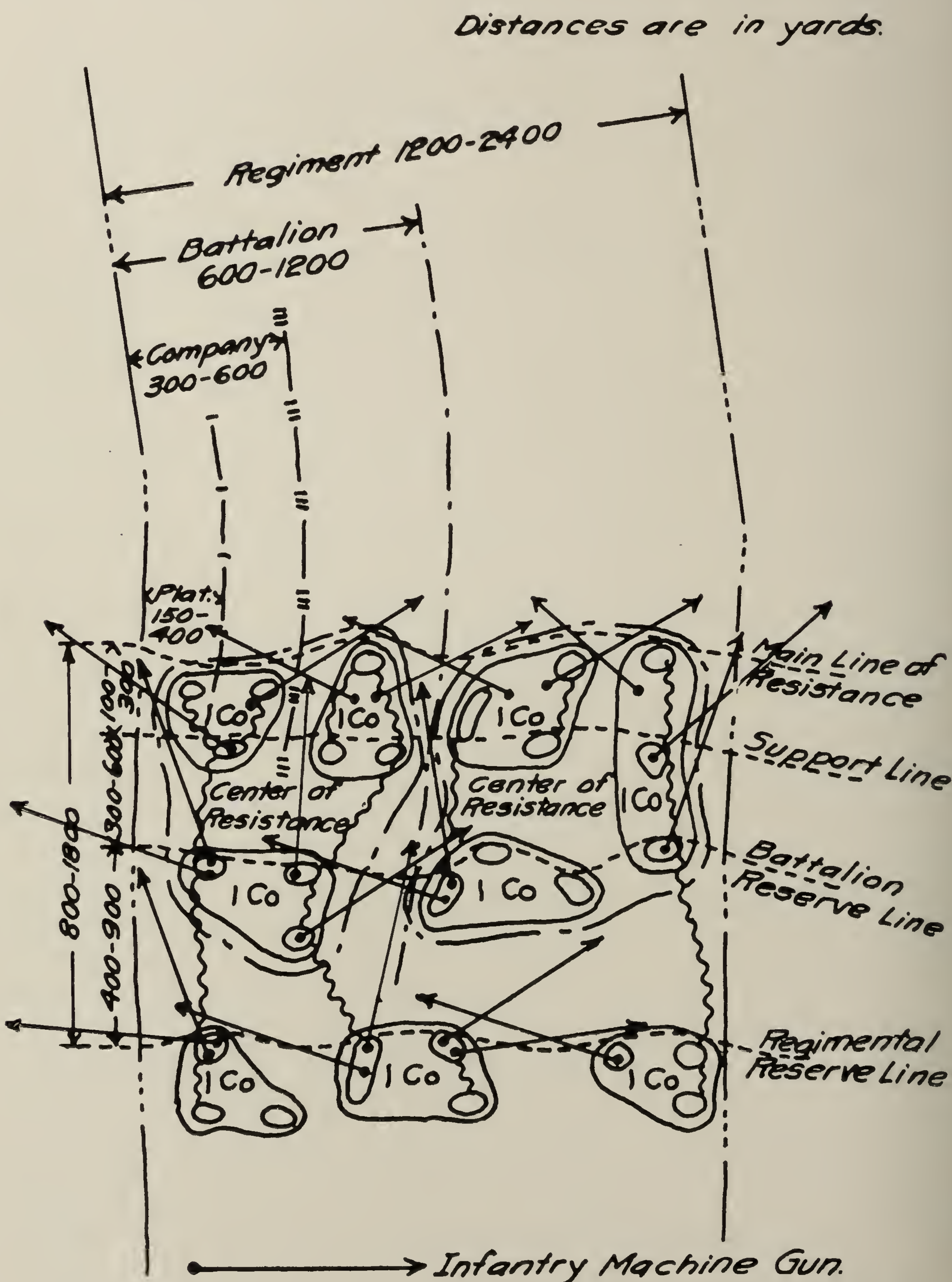


Fig. 3. Diagram of a Regimental Sector Showing Organized Tactical Localities, Frontages, and Depths, and Possible Dispositions of Machine Guns

generally similar manner, while the front line divisions are disposed side by side as shown in Figure 2. On the defensive, a division can hold a front of about 7000 yards under ordinary conditions.

Each division operates all the establishments shown in Figure 1, while the corps troops operate all those shown in Figure 2.

The chief differences between the dispositions for the offensive and defensive are that greater fronts are held and that all troops and establishments are disposed more in depth, for the defensive. Hence, reserves and supply and administrative establishments are farther from the front line. However, no fixed distances or arrangements can be stated, as everything depends on the terrain, the road net, and the situation.

AVIATION VS. GROUND TROOPS AND ESTABLISHMENTS

One cannot deploy antiaircraft artillery intelligently without an understanding of the types of military aircraft and their employment.

The four principal types of planes are:

Observation: Usually two-seaters, of medium speed, carrying machine guns and, at times, light bombs. They fly at varying altitudes.

Bombardment (day or night) : Large slow planes, with machine guns and a few heavy bombs or quantities of light bombs. They fly high.

Pursuit: Extremely fast, usually single-seaters, carrying machine guns and, at times, light bombs. Their function is to attack other aircraft.

Attack: These planes attack ground forces by machine gunning and bombing. Our army is the only one which makes this a distinct type of plane; in other armies, ground attack missions are assigned to pursuit planes. They fly very low indeed.

Due to the speed and maneuverability of pursuit planes, antiaircraft guns and machine guns can exert but little influence upon this type of ship. Pursuit planes should be fired upon, however, so that the burst will attract the attention of our own pursuit formations. Attack ships fly low and are targets for the machine guns. Bombing planes are the easiest targets for guns. Observation planes are good targets for guns and, when flying low, for the machine guns.

The corps and division possess observation planes only. Other types pertain to higher units.

VULNERABILITY OF GROUND FORCES

In action, the infantry is so scattered that it presents poor targets to the aviator. The artillery is more vulnerable. On the march, the infantry can scatter, but this delays the progress of the column. However, both arms possess machine guns which are equipped to fire on low-flying aircraft, as already stated.

Trains and administrative establishments offer the most attractive and vulnerable targets, whether in bivouac, on the march, or in action, and possess no means of defense against aerial attack.

ORGANIZATION, EQUIPMENT, AND SUPPLY OF THE CORPS ANTIAIRCRAFT ARTILLERY REGIMENT

Having considered the elements which are to be protected and the nature of the attacking force, we are now ready to study the corps regiment itself.

The war-strength corps regiment consists of: Headquarters and Headquarters Battery, Service Battery, Gun Battalion, and Machine-Gun Battalion.

The Headquarters Battery installs and operates the regimental command post, the telephone and radio nets to the battalions, the panels, and a motorcycle messenger service.

The Service Battery establishes a rear echelon for supply and operates the regimental personnel office.

The 1st, or Gun, Battalion comprises a Headquarters Detachment and Combat Train, a searchlight battery (three platoons of four lights each), and three gun batteries (of four guns per battery).

The 2d Battalion comprises a Headquarters Detachment and four machine-gun batteries, each battery having three platoons of four guns each.

The Gun Battalions are now equipped with 3-inch antiaircraft guns, Model 1918, mounted on auto-trailer carriage, Model 1917. For tactical purposes we base our dispositions upon the fact that at a horizontal range of 5400 yards these guns are effective to an altitude of 5500 yards. In war they fire high-explosive shells. The maximum vertical range is 8200 yards. Well-trained crews can deliver short bursts of fire at the rate of 15 rounds per minute per gun. Each gun battery has also four 0.50-caliber antiaircraft machine guns for its close protection.

In war, the machine-gun battalion will be equipped with 0.50-caliber machine guns which should be able to deliver accurate fire to at least 1500 yards altitude at a horizontal range of 1500 yards. The maximum vertical range is 4700 yards and the maximum horizontal range is 6650 yards. They can fire 400 shots per gun per minute in short bursts. Machine guns will be mounted in trucks, so that to open fire it will be necessary only to halt the trucks; but when a position is to be occupied for more than ten minutes, the guns will be dismounted from the trucks and set up on the ground.

The 60-inch barrel type is the latest model of searchlight. Six thousand yards slant range is a dependable maximum average for illumination of targets under average conditions of visibility. Each searchlight platoon is equipped with two sound locators to aid in picking up the target.

The regiment is equipped with a limited number of passenger cars, motorcycles, light trucks, gas trucks, reconnaissance cars, and two tractors for each gun battery, but most of its vehicles are Four-Wheel Drive trucks of 3-ton capacity. All personnel and equipment are carried in motor vehicles. Tractors (on trailers), 3-inch guns, kitchens, and water tanks are towed. Loaded, an F. W. D. truck weighs 14,510 pounds; the auto-trailer carriage with gun weighs 14,085 pounds. A tractor trailer, with tractor on it, weighs 10 tons. This is

the heaviest load in the corps except the 155-mm. G. P. F. gun. These weights must be considered when routing units over bridges.

The battalion sections of the Service Battery establish supply offices, one for each battalion. These offices are usually concentrated at the rear echelon, which is the bivouac of the Service Battery.

These sections send their trucks to the distributing point for Corps troops to receive Class I supplies (rations, gasoline, and oil) and deliver them to the battery positions.

Machine-gun ammunition is carried in the trucks of the machine-gun batteries. It is procured (usually from the railhead for corps troops or the refilling point for corps artillery ammunition) by these trucks or by the Service Battery and delivered to the battery positions.

Ammunition for the gun batteries is carried in the combat train of the gun battalion and in the battery trucks. It is procured (usually from the railhead for corps troops or from the refilling point for corps artillery ammunition) by this train and delivered to battery positions. On occasion, as when occupying a position to open fire at once or when a battery is detached from the battalion, sections of the combat train are attached to gun batteries.

Each machine-gun battery carries 6250 rounds per gun, or 75,000 rounds per battery.

Each gun battery carries 150 rounds per 3-inch gun or 600 rounds per battery; while the Combat Train, 1st Battalion, carries 150 rounds for each 3-inch gun. Thus, in the battalion there are 300 rounds per gun.

Rations are carried as follows: on the man, one reserve ration; in each battery, one field ration; in the service battery, one field ration for the regiment; total in the regiment, one reserve and two field rations per man. On the corps train, two field rations are carried.

The regiment carries two days' supply of gasoline and oil; the Corps Train, one day's supply.

COMMUNICATIONS AND INTELLIGENCE

The regiment has a radio set for communication with higher units and with the battalions, which also have sets. The regiment and the battalions are provided with panels for signalling to airplanes. The regimental telephone net goes down to include gun batteries and machine-gun platoons. Each unit lays a single telephone circuit to each subordinate unit. The regiment, the battalions, and the batteries operate motorcycle messenger services.

The regiment forms a part of the antiaircraft Intelligence Service. It gives warning to its own units, to the Air Service, and to other interested elements, of the approach of hostile aircraft. It also makes a daily report of the exact operations of all enemy aircraft observed.

It must cooperate with the Air Service in every way. The Air Service should keep it informed concerning the operations of our own aircraft, in order to assist in identification and to facilitate antiaircraft artillery support.

TIME AND SPACE FACTORS

Theoretically, the road speeds of FWD trucks, including a halt of 10 minutes each hour, should be 8 m. p. h. by day, 6 m. p. h. by night with lights, 5 m. p. h. by night without lights. However, even on good roads and gentle slopes, the gun battalion averages only about 6 m. p. h. by day, due to the heavy gun trailers. Undoubtedly we shall, in the next war, have trucks which can pull the guns at the necessary speeds; while even with the present equipment, the machine-gun battalion and Headquarters and Service Batteries can maintain the theoretical speeds. Standard speeds for light vehicles (passenger cars and Cadillac searchlight units) are by day, 20 m. p. h.; by night with lights, 15 m. p. h.; by night without lights, 10 m. p. h.

ROAD FORMATIONS

Distance in yards between units	*Normal March*	*Moving, closed*	*Halt*
Individual vehicles	21	7	5
Batteries	40	20	3
Battalions	50	50	3

The table below shows road spaces as given in the current Training Regulations. These figures are slightly different from those that would result if we should make a careful calculation on the basis of the vehicles prescribed in new Tables of Organization from time to time, but do not differ materially from them.

ROAD SPACES AT NORMAL MARCH DISTANCES

	Yards	*Miles*
1 Searchlight battery	700	0.4
1 Gun battery	450	0.3
Hq. Det. and C. Tn., 1st Bn.	860	0.5
Total gun battalion	3070	1.7
1 Machine-gun battery	555	0.3
Hq. Det., 2nd Bn.	165	0.1
Total machine-gun battalion	2555	1.5
Service battery	630	0.4
Headquarters battery	160	0.1
Total Regiment	7000	4.0

The Regiment ordinarily travels in two echelons, a light column and a heavy column. The searchlight units comprise the bulk of the light column; the rest of the regiment, with the exception of a few light vehicles, constitutes the heavy column.

When traveling on roads subject to enemy aerial observation, to bombing by enemy planes, or to the fire of enemy ground troops, distances between vehicles and organizations should be materially lengthened; and at halts, vehicles should be stopped near houses, trees, or other features which reduce visibility and vulnerability.

A gun battery, with attached searchlight platoon, considering all kinds of terrain, will require on the average about one hour to go into position and open fire, and about the same length of time to withdraw and form column on the road. Both operations can be performed in much less time under favorable conditions. A machine-gun platoon can go into or out of a position close to the road in five minutes; if the guns must be transported some distance by hand, the time is longer.

TRAFFIC CONTROL

In field operations, owing to the tremendous traffic and the scarcity of good roads, it is usually necessary for corps and division commanders to institute restrictions on traffic; for example, certain roads may be reserved for motor vehicles, others may be designated as one-way roads. It is therefore usually necessary for unit commanders of the Corps Antiaircraft Artillery Regiment to confer with corps and division staffs in regard to movements of their units. When practicable, however, the regimental commander makes all such arrangements.

Due to the difference in rates of march, it is rarely practicable to move the Corps Antiaircraft Artillery Regiment, a motorized unit, over roads that are in use by foot or animal elements.

The divisions control traffic in advance of their rear boundaries. The corps controls traffic between division rear boundaries and the corps rear boundary.

It must be remembered that very often it will be impossible for the antiaircraft artillery to find roads that are free of foot or animal elements, when going into position or withdrawing. Even when covering a march, this condition is likely to exist; for example, when roads are scarce and several corps are moving abreast or when an independent corps is crossing a defile. In such cases, the time, route, and other details of the movement must be fitted in with the movements of other troops in the most advantageous manner. This will often be an extremely difficult problem and such conditions may result in a considerable lessening of the protection that would be desirable at certain times and places.

TACTICAL DISPOSITIONS WITHIN THE REGIMENT

Battery Dispositions

A gun battery located for action always forms a single compact unit except for the altimeter base-end stations. There is generally attached to it a searchlight platoon, whose lights are disposed at the four corners of a rough square, 2000 yards on a side, the center of the square being approximately at the position of the gun battery; however, they must not be arranged so symmetrically as to indicate the position of the guns. The lights should be parked under cover during daylight. The two sound locators of the searchlight platoon are placed near two of the lights and connected to them by telephone or a "follow-the-pointer" system. The searchlights are connected by telephone to the

platoon commander's post, which is usually at the gun battery. The gun battery commander proceeds to the general position indicated by the battalion commander and picks out the exact location for each element of the battery. The gun battery commander may indicate the general position of each light or may direct the searchlight platoon commander to choose his own positions. The gun battery commander locates his four machine guns. The 3-inch guns of a battery are usually placed in a rough square, 50 yards on a side, with the range section in the center. The trucks and the kitchen should be placed at least 200 yards away from the guns. Alternative battery positions should be reconnoitered.

A machine-gun battery, on the other hand, is rarely grouped in a single firing unit. Instead, the platoon is the fire unit. The four guns of a platoon are rarely widely separated: but the three platoons of the battery are generally located some distance apart, in a manner that depends upon the nature and shape of the ground feature or military element covered by the battery. Thus, to cover a long stretch of road, platoons are placed at intervals near the road; to cover a small area, they are disposed in a triangle. When the feature to be protected is not too large, adjacent machine-gun platoons should be within about 1200 yards of each other, so that all three platoons of a battery can concentrate their fire over the vital spot. The battery commander usually indicates the general location of each machine-gun platoon, of the battery command post, and of the kitchen.

The primary consideration in selecting the firing position of a gun battery or machine-gun platoon is an all-round field of fire, unobstructed to within 10° of the horizon. This usually requires a hill-top. Alternate positions must be chosen, observation and command posts installed, and the trucks concealed at a convenient distance. Proximity to a road is usually a necessity for the guns, since they are so heavy; but their fire must not interfere with traffic. Machine guns may be carried across country by hand. Prominent landmarks, such as cross-roads, must be avoided since they draw shell fire and bombs. Machine guns are usually dug in. In all units, trenches may be dug to shelter personnel from shell-fire.

Except in extremely unusual circumstances, enemy planes are fired upon by gun batteries or machine-gun platoons whenever they are within range, without awaiting any instructions from higher authority.

In disposing machine-gun units, some consideration should be given to the presence of the four machine guns which are manned by each 3-inch gun battery. These guns may be considered as a machine-gun platoon having one-half the effective radius of a regular platoon.

All elements are camouflaged. It is absolutely essential that the necessary steps to camouflage any position be begun at the earliest possible moment. It is useless to camouflage anything that the enemy has already discovered.

If practicable, altimeter stations and altimeter telephone lines should be installed prior to the arrival of the gun battery. Range sections should precede

the battery. It is advantageous to install the regimental telephone net, or parts of it, prior to the arrival of the regiment.

To facilitate control, administration, upkeep, and instruction, the searchlight battery is kept together except when gun batteries are in firing positions or when one or more gun batteries are separated from the rest of the battalion. In these cases, searchlight platoons are generally attached to the gun batteries.

Battalion Dispositions

The gun battalion should cover important elements of the corps. When practicable, it should be disposed so as to combine the fire of two or three batteries for the defense of the most important and vulnerable of these elements. The battalion commander usually indicates the general position of each gun battery and attaches the searchlight platoons to them. He generally indicates the routes of march for the batteries to use in reaching their positions.

A still greater degree of discrimination is necessary in assigning missions and localities to the machine-gun batteries. There will never be sufficient antiaircraft machine guns to cover all elements of the corps which may be subject to attack; and it is necessary to concentrate our efforts where they will best further the object of the corps commander. The machine-gun battalion commander assigns missions to each battery by indicating the elements each is to cover. He usually indicates also the area within which the battery is to locate its platoons, and he may prescribe routes to positions. To insure coordination between adjacent batteries, he may prescribe how many platoons each battery is to place in the forward part of its area or how many platoons are to be located to cover a given establishment, or he may adopt some other means of indicating the general disposition of platoons within the battery. Only in exceptional circumstances will it become necessary for him to indicate the exact position of platoons, thus depriving the battery commanders of initiative; but he should not hesitate to do so when there is no other way of coordinating the defense properly, as, for example, when two or more batteries are covering a very small area.

Probable directions of approach are important factors to consider; but airplanes can come in from any direction, and it is wrong to stress this consideration too much.

The two battalions must know each other's plans and coordinate their action; but the missions, targets, and capabilities of the two weapons are so different that often the dispositions of one will have no appreciable effect upon those of the other. Nevertheless, there is a real need for coordination; for example, if circumstances demand it, an element ordinarily requiring machine-gun protection may be more readily denied that protection if it is known to be covered by a gun battery.

Battalion commanders indicate the locations of battery command posts.

When it is necessary to change positions, normally at least one battery should be kept in action while others are displacing.

Regimental Dispositions

The regimental commander assigns missions to each battalion and co-ordinates their action. Occasionally, he may prescribe the location of individual gun batteries and details of the movements of any or all batteries of the regiment. The usual reason for such action is to insure compliance with traffic arrangements which he has negotiated with commanders or staffs of divisions or the corps.

He indicates the location of the Service Battery and of regimental and battalion command posts. There are times (as in preparation for an advance) when the Service Battery and the command posts may be located centrally or even well up in the vicinity of the forward elements of the regiment, instead of being always in rear. However, the regimental commander must have good communication with the Corps Chief of Artillery.

RECONNAISSANCE

On the march, roads must be reconnoitered in advance and guides left at critical points, such as cross-roads.

When going into position, commanders (travelling in passenger vehicles) should precede their units to reconnoiter routes and select positions. If the unit is in march, it should continue the march under the command of the unit executive to an appointed spot, where it should halt and await orders. To avoid delay, this spot should be as close as possible to the expected position of the unit, and the unit commander or his representative should reach this point, to conduct the unit to position, as soon as possible.

The reconnaissance of the regimental commander is of a very general nature. The machine-gun battalion commander often confines his reconnaissance to an inspection of the roads which he expects his batteries to use, it is generally the battery commander's duty to locate individual platoons. The commander of the gun battalion reconnoiters roads and battery positions. In order to avoid attracting enemy attention, reconnaissance parties should be as small as possible. To avoid casualties and to avoid revealing the locations of the elements covered by the antiaircraft artillery, alternative positions should be selected and reconnoitered for all elements of the regiment. In the combat area especially, frequent changes of positions may be necessary.

Tactical Employment of the Corps Antiaircraft Artillery Regiment

MISSIONS

"*The mission of the antiaircraft artillery is to furnish a local defense of our ground forces and establishments against hostile aerial activity.*"—Par. 5, TR 435-30.

"*The antiaircraft artillery regiment of the corps operates under the corps chief of artillery and is employed for the protection of all elements within the corps zone of action, sector or area, except such as are covered by the army.*

The corps antiaircraft artillery regiment provides gun defense for all elements of the corps, but, since the combat elements of the corps are provided with their own antiaircraft machine-gun defense, the machine-gun battalion of the corps antiaircraft regiment is generally employed to cover the supply and administrative elements of the corps, rather than combat elements."—Extract from par. 19, TR 435-30.

DEFENSE OF A SMALL LOCALITY

(Such as an Airdrome or Ammunition Dump)

The corps regiment, in its entirety, will rarely be called upon to defend a small locality. However, such an occasion may sometimes arise; moreover, a very brief discussion of this problem will serve to bring out some of the principles which must be applied in other situations.

The gun defense is arranged primarily to meet the attacks of bombing planes.

Batteries should be located so as to concentrate their fire upon approaching planes before they drop their bombs. With present bombing sights, airplanes must fly a straight course for at least twenty seconds before the instant of releasing their bombs. Considering average conditions, it has been calculated that a bomb dropped within 1500 yards of a certain area will fall within the area, while the artillery should be able to open fire upon attacking planes at least one minute before they reach the point where they can discharge their bombs. Thus, there is a belt or "danger zone" 1500 yards wide around the defended area and a "Sensitive outer zone" beyond that. It is considered essential that, when possible, batteries should be disposed to deliver maximum concentrations of fire upon an airplane the moment it arrives within 4500 yards of the defended area. It is highly desirable to deliver fire beyond that limit, but it is more important to deliver the fire of at least one battery over all parts of the 4500-yard sensitive belt.

Because of their short range, machine guns must necessarily be located close to the defended area, so as to fire upon low-flying planes.

Probable directions of approach should be considered. However, the usual tendency is to give too much weight to this factor. While bombing planes may follow a river, railroad, or other feature to guide them on a long trip, it by no means follows that they will fly directly above it when they reach the close vicinity of the target; they may swing out and then come in on the objective from any direction.

The dispositions will be affected by the shape of the area. Bombing planes secure a greater number of hits if they fly over the longer axis of the area.

COVERING THE CORPS ON THE MARCH

Until contact with the enemy is imminent, the Corps usually marches with its divisions and the corps troops rather widely separated, occupying an extent of country that cannot entirely be protected by the corps antiaircraft regiment.

During this phase, it is often advisable to attach machine-gun batteries to divisions and to the corps troops, and even gun batteries may be so attached.

When the corps concentrates, it is usually advisable for the regimental commander to resume control of some or all elements of the regiment.

So much time is required for 3-inch antiaircraft guns to go into and out of position that it is not practicable to cover the route of a day's march by moving from position to position. About all that can be done is to provide a strong defense at the original bivouac until the bulk of the troops have cleared and then, by exploiting the superior speed of the regiment, set up a defense at the destination. The displacement may take place by battery, weakening the defense of the original bivouac gradually as the troops to be covered are reduced. However, troops and trains marching along defiles are extremely vulnerable to air attack, and important defiles along the route should be covered during the passage of the bulk of the troops.

Machine guns may cover marching columns from successive positions if there are parallel roads, since machine-gun platoons can go into and out of firing positions with great rapidity. If the column to be protected is composed of motor vehicles, machine-gun trucks may be distributed through the column and move with it.

Covering the Corps in an Attack

GUN BATTALION

"*In covering combat troops in contact with the enemy the mission of the gun defense becomes primarily the neutralization of hostile aerial observation. In addition, it protects our observation balloons and observation planes and assists our pursuit planes.*"—Extract from par. 26, TR 435-30.

If we lay out on a map the dispositions of a corps, acting alone, deployed for an attack, it will be found that by a judicious arrangement of two gun batteries forward and one in rear, we can usually bring the fire of at least one battery to bear over most of the troops and important establishments. This can be shown graphically by drawing a circle of 5400 yards radius for each battery. The batteries should be so located that the fire of two or more may be concentrated over the more important troops or establishments, so far as this can be done without uncovering others that must be protected.

Since antiaircraft weapons must be located on commanding ground, they are conspicuous and likely to draw fire from ground troops. For this reason, it will not usually be practicable to place 3-inch antiaircraft gun batteries within less than 2000 yards from the front line. On the other hand, since it is an advantage to bring enemy planes under fire as soon as possible, the batteries that cover forward elements must not be too far back.

The dispositions of the machine-gun battalion must be taken into account.

When the corps is part of the army, the antiaircraft defense must be coordinated with that of adjacent corps and of army antiaircraft artillery units.

Thus, if our corps is between two other corps and is assigned a fairly narrow front, there are times when it is better to place but one battery forward and two back, taking advantage of the presence of batteries of other regiments located near the corps boundaries. Moreover, the army will often furnish protection for some corps establishments.

MACHINE-GUN BATTALION

In the attack, it is difficult to control the advanced elements of the machine-gun battalion. It is difficult also for the regimental and battalion commanders to keep in touch with the rapidly changing situation. For these reasons, in an attack with unlimited objectives it is often advantageous to attach machine-gun batteries to assault divisions. When so attached these units are used by division commanders to reinforce the antiaircraft defense maintained by divisional troops with their own weapons. The attached antiaircraft machine-gun units may cover troops, command posts, distributing points, railheads, and airdromes.

In an attack with limited objectives, control is simpler and it is rarely necessary to attach machine-gun elements to divisions.

Those elements of the antiaircraft machine-gun battalion which are not attached to divisions are employed to cover distributing points, dumps, reserves, and other establishments and elements in rear of the area of combat troops in position.

Due to the short range of machine guns, the small number that are available, and the fact that a platoon of four is usually the smallest group which it is worth while to use for a single mission, it is perfectly obvious that machine guns cannot be assigned to each one of these scattered establishments. We must consider, for each, how tempting a target it offers, how much it can be deranged by an aerial attack, and how seriously the plans of the corps commander would be affected if its functioning should be impaired. Comparing them all by these standards, we pick out those that it is essential to protect and allot our machine-gun units in such a way as to cover them adequately.

The dispositions of the gun battalion, and of the antiaircraft gun and machine-gun units of the army and of adjacent corps, will affect our plans. The army will often furnish protection for some corps establishments.

GENERAL

In the attack, all troops and establishments of the corps, including the corps antiaircraft regiment, are disposed as far to the front as conditions permit and must be prepared to displace forward promptly. The regiment must be familiar with routes of advance and must pick out tentative advanced locations.

In all cases, it is the duty of the army commander to coordinate the defense set up by his corps and army antiaircraft artillery regiments.

DISPOSITIONS OF THE REGIMENT FOR THE DEFENSIVE

On the defensive, the vital thing for the corps is to hold its position unbroken. Therefore, the antiaircraft gun and machine-gun units must be placed with the primary object in view of covering "all forces and elements essential to the maintenance of the position." On the other hand the possibility of a withdrawal is always present, and the antiaircraft artillery must be prepared to cover such a movement. Since the advanced combat elements of the infantry and field artillery are sure to be located and attacked by low-flying planes, some of the antiaircraft machine-gun batteries should be located even further forward than in the attack. The gun batteries, however, should be somewhat further back than in the attack, so as to facilitate withdrawal and also because the corps is extended in greater depth when on the defensive.

Antiaircraft gun batteries should never be located in the outpost area, because they will do very little good there and would be easy prey for an attacking force.

The regiment must be familiar with plans for counterattacks and be prepared to cover them. It must also select routes of withdrawal and possible positions for use if withdrawal is ordered.

After every declaration of peace, our people have apparently assumed that the peace would be eternal, that no more war would come; and now after the Great War, which some phrase has called "The War to End War," there comes from some of our citizens a large demand for the destruction of armament and suggestions that, if we only set an example, the other nations will be moved by our nobility to beat their swords into plough shares, convert their tanks into field tractors, and turn their warships into junk. The advocates of disarmament can visualize the millennium if only their doctrines are followed but cannot or will not see the actual world conditions existing today.—Admiral Hilary P. Jones.

A German Instrument for the Preparation of Antiaircraft Fire

THE SCHÖNIAN INSTRUMENT, MODEL 1918

By Major P. Vauthier

Translated from the *Revue d' Artillerie* in the Military Intelligence Division

THE name of this instrument is the *Flakkommando Schönian 1918* or the *Kommandogerät Schönian 1918 or the Auswanderungsmesser Schönian 1918.*

The Schönian instrument is to be used for the preparation of antiaircraft fire. Sixty of these instruments were ordered in February, 1917, from the Zeiss firm of Jena. Twenty of them were delivered and placed in service before the time of the armistice; of the remaining forty, some were destroyed and the others were abandoned after the armistice when work was stopped on them. The instrument was used at the front from the beginning of 1918 with guns of 7.62-cm. caliber, 8-cm. caliber, and 8.8-cm. caliber; only the ballistic graphs differ from one caliber to another.

According to Major Neumann (*Die deutschen Luftstreitkräfte im Weltkriege*, Berlin, 1920, page 281), "the Schönian instrument was the most perfected of the instruments for the preparation of antiaircraft fire used by the Germans."

We shall here give the characteristics of this instrument, as we believe that an examination of the solutions of the problem of antiaircraft fire considered as the most perfect in Germany at the time of the armistice may be of interest to French antiaircraft artillerymen.

After having given a brief description of the general appearance of the instrument, our examination will dwell on the following points:

Determination of the data concerning the present position of the airplane (position, movement),

Solution of the principal problem (future position of the airplane),

Secondary problems,

Determination of firing data,

Operation of the instrument.

I. General Description of the Instrument

The instrument is supported on a light tripod, of which the feet may be embedded in the ground. The three feet are kept a fixed distance apart by a star-shaped cross brace (Figure 1).

The instrument proper is in the form of a small box: length about 0.50 meters, width about 0.30 meters, height about 0.50 meters. Its weight, not including the tripod, is about 50 kgs. (Fig. 2).

The instrument is closed on all sides excepting one, and in that is a window closed by a transparent plate. Through this window the details of the mech-

anism and several graphs may be seen. One monocular telescope is used for sighting the present position of the airplane. The instrument terminates above in a protuberance which forms a housing for a ballistic graph in all positions which it may assume, and at the bottom by a cylinder on which the system of curves is engraved.

A manning detail of four men is enough to operate it. The cylinder E (Fig. 17) is for reading the corrections for deflection or azimuth for the future

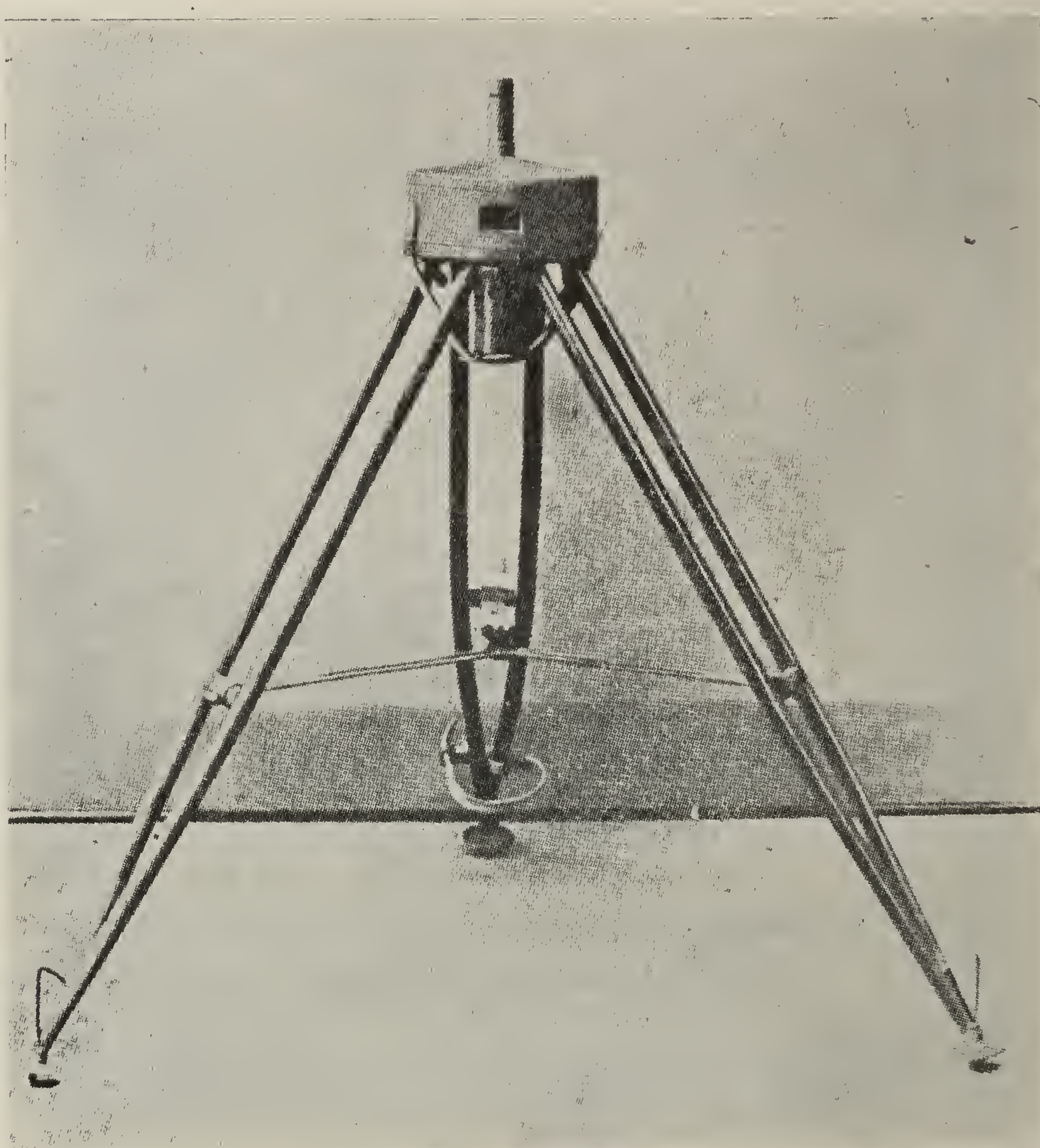


FIG. 1. TRIPOD

position of the airplane. The face AB is for reading the inclinations and the fuze setting, or for reading the corrections in deflection and site. The face CD is used for calculating the elevation.

The instrument may be used:

(a) In direct fire, in which case the pieces, aimed in direction and elevation on the target, are given from the instrument a deflection correction (in the plane of site), a site correction, a fuze setting, and, in case of need, an elevation;

(b) In semi-direct fire, in which case the pieces, aimed at the target in direction only, are given a correction for deflection (in the plane of site), a fuze setting, and, depending upon the case, either the inclination (or elevation)

or the altitude, which, combined with the fuze setting, may be used to determine the inclination (or elevation); or

(c) In indirect fire, in which case the pieces do not use their sighting apparatus and are given the azimuth, the angle of elevation, and the fuze setting.

Figure 17 gives a diagrammatic representation of the whole instrument. It has only one monocular telescope L, the observer having to sight at the same time in direction and in elevation.

The present position of the airplane is represented by a point A_0 fixed in relation to the instrument; on the contrary, the point P, which represents the battery, is mobile. The relative locations of A_0 and of P are such that the

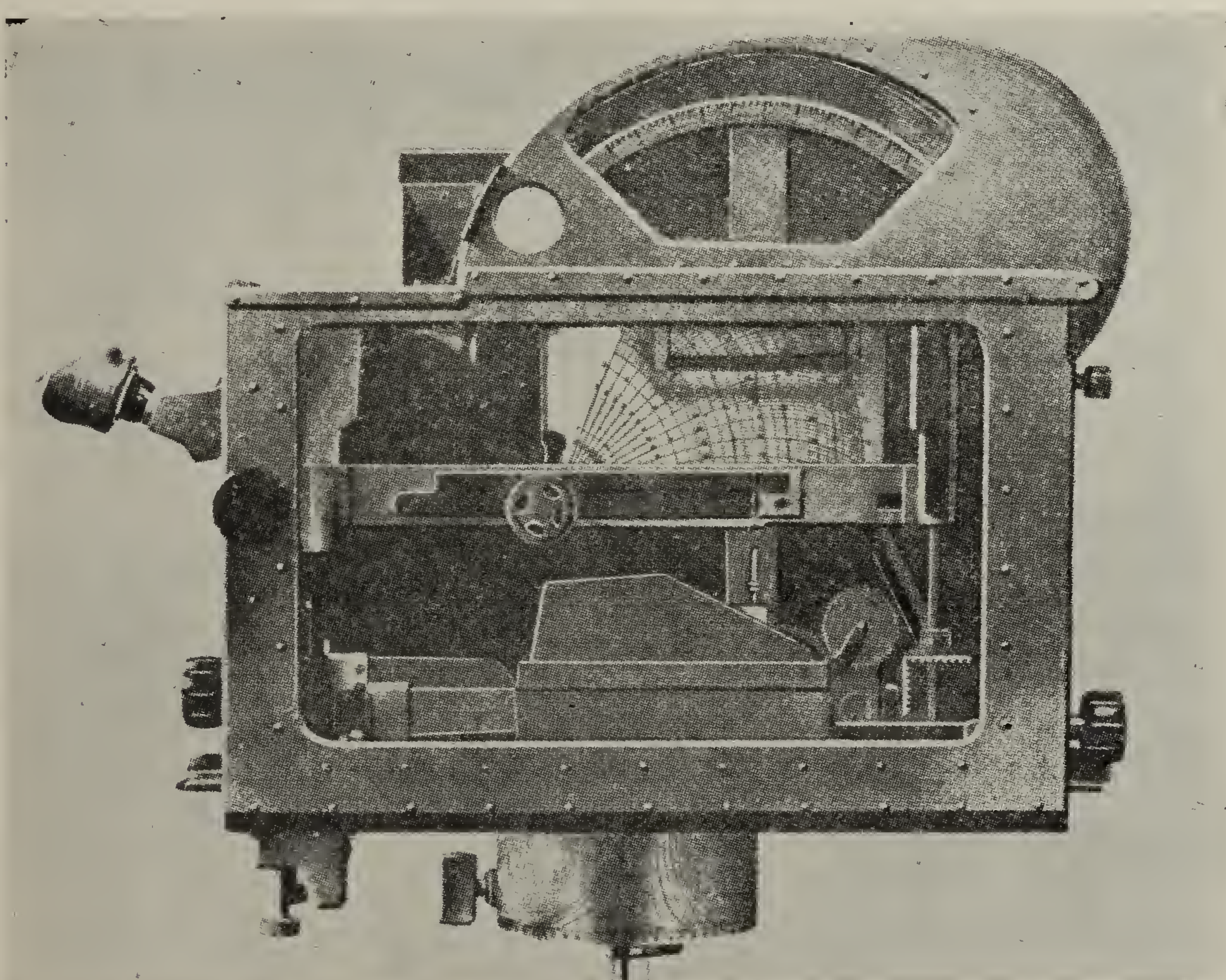


FIG. 2. THE SCHÖNIAN INSTRUMENT

angle made by PA_0 with the horizontal is equal to the angle of site s_0 of the present position of the airplane, and that the distance PA_0 is proportional to the range D_0 to the present position of the airplane. Consequently, the line Pa_0 will be proportional to the horizontal range Δ_0 and the line A_0a_0 will be proportional to the altitude.

The point A_0 is situated in front of a vertical plotted graph on which are traced the trajectories and curves of equal fuze setting for powder-train fuzes, or curves of equal time for mechanical fuzes. The graph F is therefore a graph of trajectories, from which the firing data for the present position of the airplane may be read. The graph F may be moved with two rectangular movements, one in altitude and one in horizontal range, or with a single movement which is the resultant of these two movements. These movements serve to

displace the point P, which represents the piece, so as to give a proper form to the vertical triangle PA_0a_0. The graduated scale G_h and G_Δ may be used for reading or introducing the values of h and of Δ_0; one graduated scale G D_0 on a vertical wheel H is used for reading or introducing the value of D_0.

The data for the movement of the airplane from its present position, which are used in the instrument, are the air speed of the airplane and the direction in which it is moving.

In order to measure the air speed of the airplane, the instrument is used like a tachyscope, counting the time required by the airplane to cover a certain known distance (here 180 meters); in order to make this measurement, it is necessary to halt the instrument during the measuring process. The measurement of the speed therefore can be only intermittent. A partial remedy to this disadvantage is to be found in the wind calculating instrument J; the action of the wind on the airplane is added geometrically to the action of the air speed of the airplane entirely automatically, whatever the direction in which the airplane is flying.

The direction of flight of the airplane is, however, kept up to the minute continuously by the observer; it is even kept up to the minute automatically by the instrument so long as the airplane follows the same straight line. The observer does not have to intervene except in case of change of direction of the airplane.

The point A_0, which represents the present position of the airplane, is represented by the point of a glass needle I; when the instrument marks a speed of zero for the airplane, the needle is in a vertical position. In order to pass from the present position of the airplane to a future position A of the airplane, for values which are not zero for the speed of the airplane, the glass needle, whose point normally represents the future position of the airplane A, may be moved in different ways and through different amounts, the details of which movements will be considered later. These displacements are complex functions of the speed, the direction of flight, the data concerning the position of the airplane, and the ballistic data for the trajectory. They are given—

(a) On the one hand, by the observer, who in measuring the direction of flight a_0, determines the vertical plane in which the glass needle may move;

(b) On the other hand, by operator No. 4, who determines the vector Vt with the use of a single milled head V_4 from an examination of the graphs K and M.

After these operations have been completed, the end of the glass needle I represents the future position of the airplane. The firing data i and B are read off on the graphs showing the trajectories F on a line dropped from the end of the glass needle. The azimuth ϕ is read off on the graduation G_φ to the right of the index on the lower cylinder E. The correction for deflection and for site may be read off in the reading glass S. Lastly, the elevation may be read off on a disk T, which is on the face GD of the instrument.

II. The Present Position of the Airplane

An instrument for the preparation of fire should determine and record the data for the present position of the airplane and the data concerning its movement.

a. Data of Position.—The linear coordinate—altitude or range—is determined aside from the instrument on a monostatic range finder. The Schönian instrument uses at will the altitude, the slant range, or the horizontal range. The continuity of the sighting, in the intervals between the intermittent determinations of the monostatic range finder, is assured only by the use of the altitude datum; it is no longer assured when the slant range for the horizontal range is used. But the instrument can, however, receive any one of these three linear coordinates, as the officer controlling fire may desire. It may thus be possible to transfer instantaneously from fire by altitude (airplanes with high altitude) to fire by slant range or by horizontal range (airplanes at low altitude).

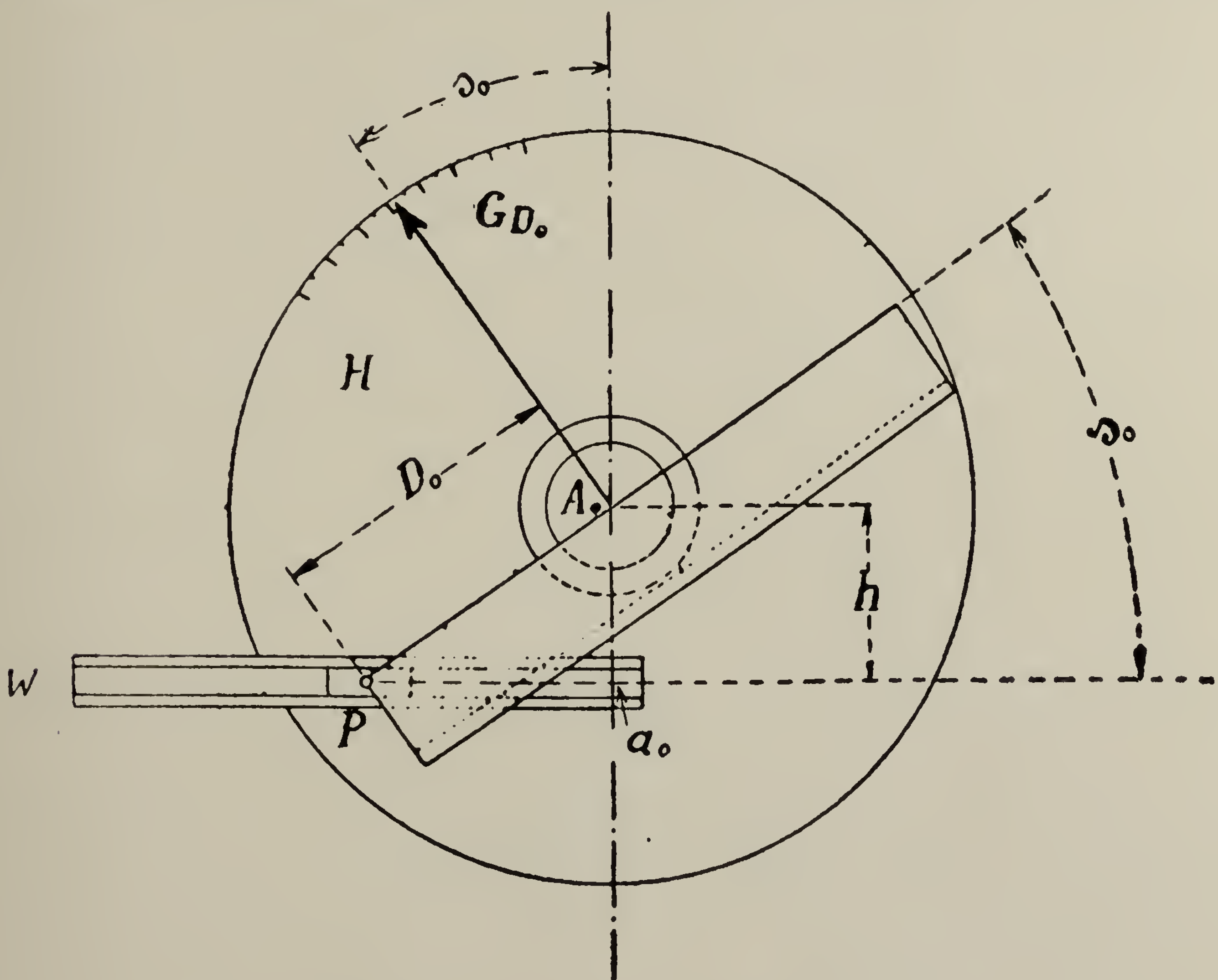


Fig. 3. The Aiming Triangle U

This is done by the materialization of the vertical triangle PA_0a_0 in its real size. Figure 3 represents the mechanism U which is situated behind the graph F, bearing the graphs of the trajectories. The point A_0 is fixed. The point P receives two movements: one places the horizontal slide W at a vertical distance h from A_0; the other forces P to remain on the straight line PA_0, which, on the other hand, receives an inclination equal to the site of the present position of the airplane s_0. The site of the present position of the airplane s_0 is transmitted to the mechanism U by the observer.

The angular coordinates of the present position of the airplane are given, as in all instruments of this kind, by the observer, who follows the movement of the airplane with his telescope. In order to sight in azimuth, the observer moves the whole instrument around a vertical axis, this movement being effected directly, without the intermediation of any sighting instrument, by having the observer turn the control buttons V_1 and V_2 to the side. This device does not make it possible to obtain very precise sighting in direction; it does make it possible to use the observer for another operation and to employ him for de-

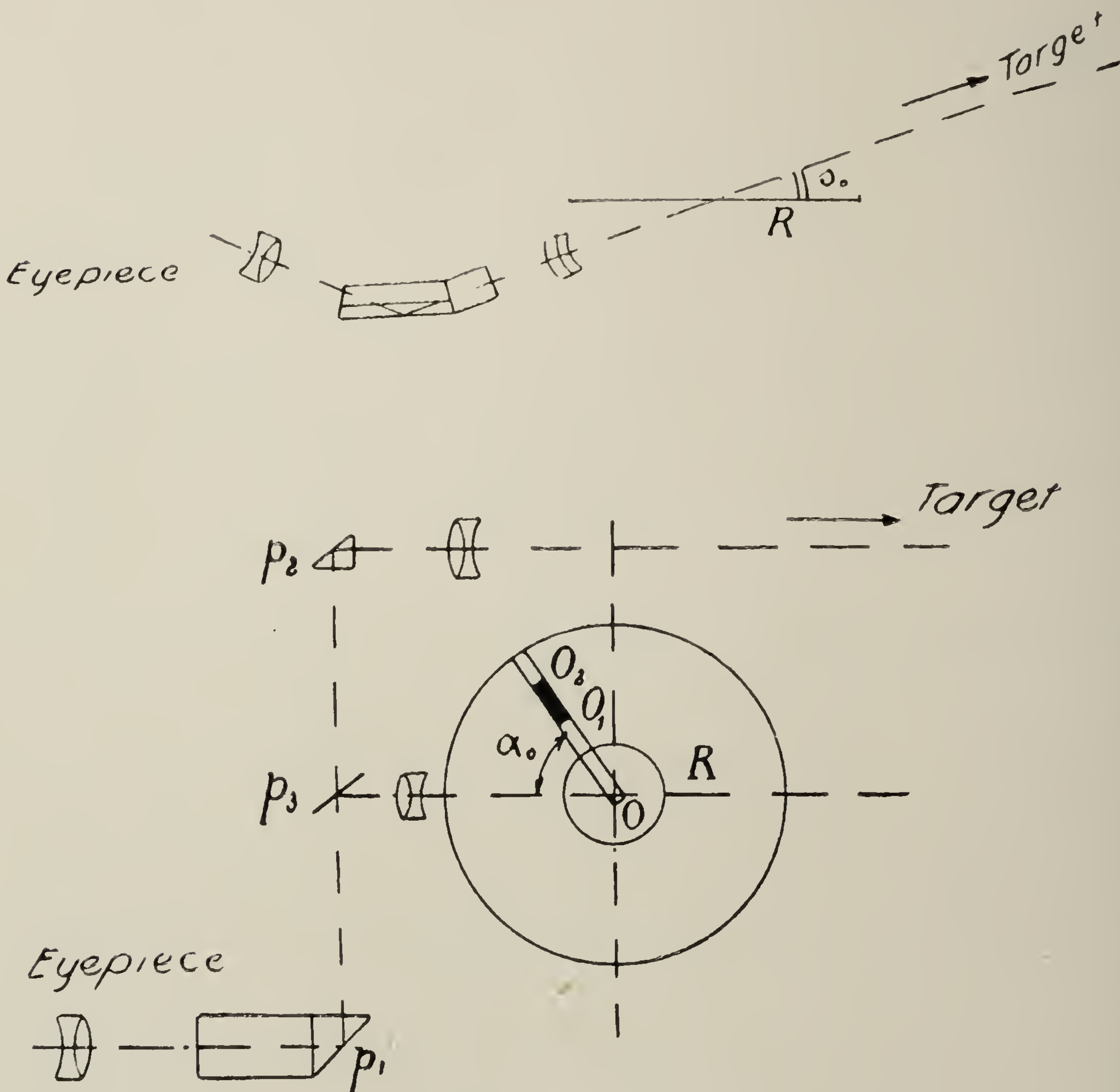


Fig. 4. The Aiming Telescope L

termining the direction of flight of the airplane. But we cannot help thinking that great demands are placed upon this one operator, for he has to perform three operations: sight in direction, sight in elevation, and determine the direction of flight of the airplane. It is to be feared that each of these operations will be performed with very little precision.

The telescope of the observer has only one magnification, 4, and its field amounts to about 12°. Figure 4 gives the diagrammatic representation of the telescope, which is a prism telescope with a bent line of sight. The luminous rays come from two different sources; first, from the target (prisms p_2 and p_1), then from a horizontal mechanism R which serves to determine the angle of

flight direction a_o and the air speed of the airplane V (prisms p_3 and p_1). The two sheaves of luminous rays give superposed images.

b. Data of Movement.—We shall see in detail the part played by the mechanism R, which is used for determining the data of movement of the airplane from its present position.

The solution adopted for determining the ground speed is very analogous to the solution employed in France with the tachyscope. The mechanism R is composed essentially of a horizontal miscrometer of a special kind. It has a small inside circle with an apparent diameter of 2°; it also has a radial tube or hand $0\,0_1 0_2$ which can be set at any angle from 0° to 360° in the horizontal plane. The tube, or hand, $0\,0_2$ has a plug or obstacle $0_1 0_2$ in it, and this plug can occupy various positions, so that the distance $0\,0_1$ always corresponds to the perspective of a constant distance in space, and this distance has been selected as 180 meters. This result is obtained by a connection with the mechanism U, which makes $0\,0_1$ a function of D_o.

To measure the speed, the observer stops the movement of the instrument and at the same time starts the split-second hand of a chronometer Q (Fig. 17). He then stops the split-second hand when the airplane has arrived at 0_1. At that moment the distance covered by the split-second hand is proportional to the velocity to be measured; the chronometer has been directly graduated for ground speeds.[1] It is sufficient to read off the value of the speed on the chronometer and to transfer it to the mechanism J (Fig. 17).

We must call attention to the fact that the micrometer R is always horizontal; on the other hand, the angle s_o may be of any value between 0° and 90°. Hence the instrument has solved a particularly important problem of optics, that of making the plane of the micrometer independent of the movements of the optical axis of the telescope. The observer, looking in the telescope, sees the perspective of the horizontal plane of the micrometer in a plane perpendicular to the optical axis of the telescope. Any point on the radial hand or tube $0\,0_2$, 0_1 for example, which describes a circle in the horizontal plane R, appears to the observer to describe an ellipse. This arrangement, which is especially fine from the theoretic point of view, gives an optical solution of the tachyscope which is very superior to the French solution.

The mechanism R also is used for the determination of the direction of flight of the airplane. Besides his functions of pointing or aiming proper, the observer has to keep the radial tube $0\,0_2$ on the fuselage of the airplane; he controls the direction of the tube $0\,0_2$ by actuating a button V_1 made for this purpose. The instrument is so constructed that, assuming that it has correctly recorded the direction of flight of the airplane at a given moment, this is kept up to the minute under the action of the operation of pointing the instrument in direction, so long as the airplane does not turn its nose in relation to a fixed direction, the North, for example. This is because of the fact that the rotation of the instrument acts directly on the direction of the radial tube $0\,0_2$, the observer not having anything to do except to change it for changes in direction

[1]The chronometer and the J instrument are graduated from 10 to 75 meters per second.

of the airplane. The mechanism R gives an automatic optical solution of the French orientation telescope (*lunette d'orientation*) which has to solve the following problem: Given the apparent angle of direction B (or perspective of the angle of direction) and the angle of site s_0, find the angle of direction a_0. The French solution, which solves the formula: $tg a_0 = tg B \sin s$, necessitates the reading of a graph; the French orientation telescope therefore cannot be connected to an instrument for the preparation of fire without making necessary a reading and a transfer.

The solution offered in the Schönian instrument, on the contrary, is entirely automatic; the observer does not need to read the value of a_0. The mere fact of placing the radial tube $0\,0_2$ along the fuselage of the airplane introduces a_0 into the instrument. The only criticism, which moreover is serious, which might be made of the German solution is that the determination of the apparent angle of direction β is not very precise; the solution is entirely analogous to that of the French orientation telescope, model 1916. The solution of the orientation telescope, model 1917, with doubled image seems to be superior to it.

But, everything taken into consideration, the solution inherent in the Schönian instrument, with fixed horizontal micrometer, seems to be superior to the French solution—tachyscope, orientation telescope. It is true that this latter solution is not very good; other French solutions have been very superior to it.

Considered as a whole, in the Schönian instrument, the determination of the data of motion is very uneven. The determination of the air speed of the target is good, but it cannot be accomplished except by interrupting the preparation of fire and must therefore be intermittent. On the other hand, the determination of the direction of flight of the airplane has been greatly improved, the operator who determines the direction not acting except from time to time to rectify the readings for the direction, which the instrument automatically keeps up to the minute. The solution would be still better if the man who determined the direction of flight were some other than the observer, who has other delicate operations to perform.

III. Solution of the Principal Problem

The principal problem of the preparation of antiaircraft fire has as its aim the determination of the future position of the airplane, upon the basis of its present position, it being assumed that the data concerning its present position and its movement are known.

We know that this problem cannot be solved except upon the hypothesis of a law of movement of the airplane. The Schönian instrument is based upon the hypothesis of a uniform horizontal flight; the path of flight is assumed to be horizontal and rectilinear and the speed uniform. The instrument does not help us to fire when the course followed by the airplane is not horizontal (when the airplane dives or ascends).

The solution of the principal problem with the Schönian instrument is "geometric" in nature. The type of solution reproduces on a given scale figures

in space; it is the opposite of algebraic solutions, which solve certain formulas derived from the same geometric figures. Here the instrument reproduces on the scale of 1:40,000 the geometric figure formed by the gun, the present position of the airplane, and the future position of the airplane. In the figure thus reproduced, the point A_0 is fixed in relation to the instrument, as well as the vertical plane which passes through PA_0. In connection with the present position of the airplane, we have seen how the point P, which represents the battery, is located in relation to the point A_0; we shall now see how the future position of the airplane is determined.

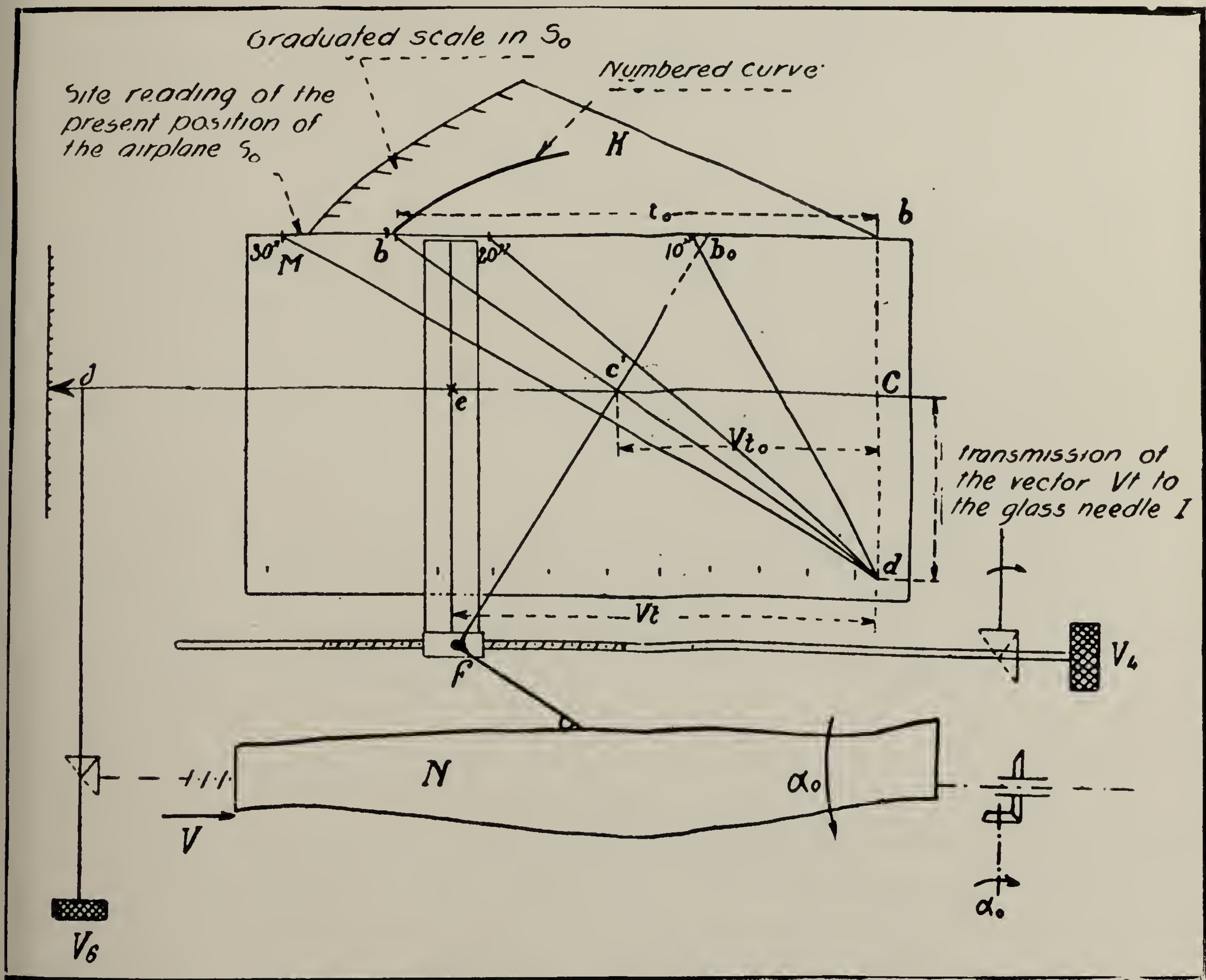


FIG 5. GRAPHS K AND M, CAM-SHAPED PLATEN, FOR DETERMINING THE FUTURE POSITION

As already stated, the observer places the mobile radial hand of the micrometer R along the fuselage of the airplane; this operation determines the direction in which the airplane is flying or the angle between the fuselage and the vertical plane of sight Pa_0A_0. Without the necessity of knowing its value, the direction of the airplane is transmitted mechanically to the glass needle I; the needle then moves in a vertical plane, which, according to the hypothesis made, contains the path of flight of the airplane. The point A is situated in this plane, on the horizontal passing through A_0 and at a distance A_0A, equal to Vt, t being the time of flight of the projectile to the point A.

The value of Vt is caluculated by the whole mechanism K, M, N, and the operating knob V_4 (Fig. 5). K is a disk which turns proportionally to the present site around the point b and which has curves graduated in true present ranges. The present site may be read off on the upper edge of the plate M. The radii vectors beginning from the point of rotation b are proportional to the actual time of the flight of the projectile.

The plate M is fixed, and has a graph of radiating straight lines. The abscissas are proportional to Vt, the ordinates proportional to V. It is therefore a graph to be multiplied. On figure M, we have

$$\frac{cc'}{bb'} = \frac{dc}{db}$$

or

$$cc' = t_0 \times \frac{V}{db}$$

Taking db as unity, $cc' = Vt_0$.

Consequently, in actuating the button V_4 to bring the vertical alidade ff' on the point c', we would give to the point f a displacement proportional to Vt_0.[2]

But, on the one hand, we must take into consideration the dead time lost in operation, and on the other hand, we must obtain Vt, and not Vt_0.

Let θ be the time lost in the operation of the instrument and Δt the difference $t - t_0$ ($\Delta t = t - t_0$). We get

$$x = V\ (t + \theta) = V\ (t_0 + \Delta t + \theta)$$

We obtain the solution of the principal problem by adding to the actual time of flight t_0 on the one hand θ, the time lost in the operation, and on the other hand, Δt.

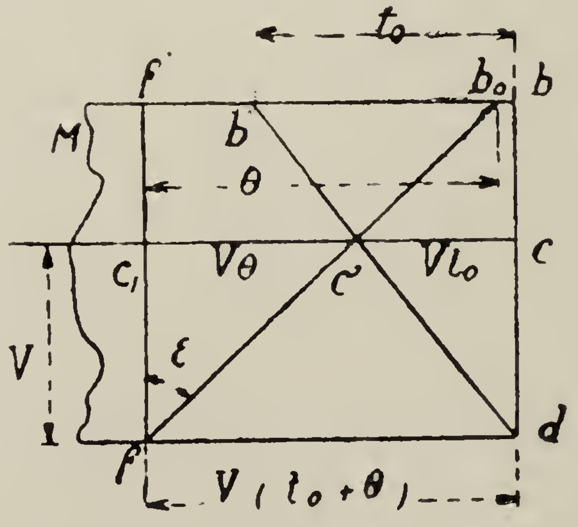


FIG. 6. CORRECTION FOR DEAD TIME Θ

The addition of θ is done as follows (Fig. 6): Around a point f an alidade fb_0 is moved, beginning from the vertical alidade ff', through a constant angle ϵ. Suppose that ϵ has been selected to cut through on the edge of the plate M a length $f'b_0$ equal to the time lost in the operation θ on the scale of the time of flight. We shall have: $C_1C' = V\theta$ and $CC_1 = df = Vt_0 + \theta$.

The additions of Δt is done with the aid of a cam-shaped piece N (Fig. 5). Δt is a complex function of the coordinates of the future position of the air-

[2] V_0 may vary from 0 to 1.8 meters; t may vary from zero to forty seconds.

plane in the plane of fire and of V and a_0. In fact, here Δt is taken as a function of t, of V, and of a_0; this is only an approximation. In order to solve the problem in this way, the alidade fb_0 has been made to move around f; the angle ϵ then becomes variable around its medium position, which corresponds to the correction for the dead time defined above. The cam-shaped plate turns at a_0. This movement of rotation is obtained automatically by a mechanical connection between the mechanism R and the cam-shaped plate. The cam-shaped plate receives a movement of translation proportional to V; this is obtained by a direct operation of the button V_6 (Fig. 5).

Lastly, the position of the alidade fb_0 is controlled by resting the finger g on the cam-shaped plate N. Figure 7 represents in diagrammatic form the method employed to determine the vector Vt which defines the future position of the airplane.

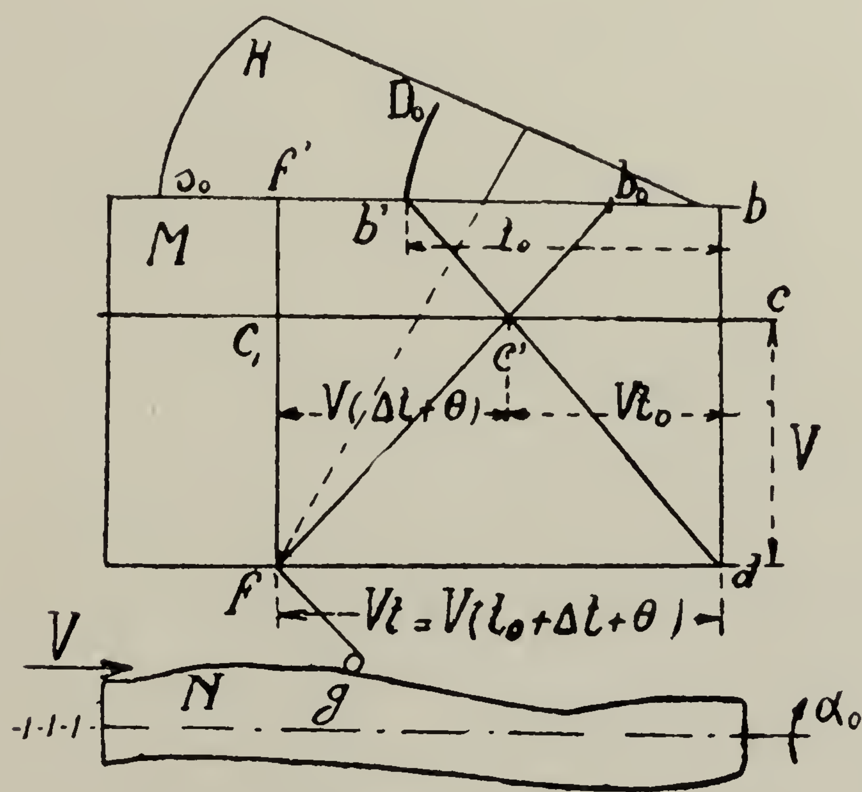


FIG. 7. ADDITIONAL CORRECTION Δt

Let us here give a brief summary of the whole operation. The operator determining the future position of the airplane reads from the graduated arc CD the range D_0 to the present position of the airplane; he then sights on the intersection b' of the curve D_0 with the upper edge of the plate M and brings the interpolated straight line $b'd$ into view. The horizontal alidade C_1C is placed in its position by the mechanism J which is used for the calculation of the ground speed; the observer then sights on the intersection of the interpolated straight line $b'd$ and the horizontal alidade C_1C and, by actuating the button V_4, brings the alidade fb_0 through the point C′, as the result of which the horizontal distance between the points f and d is equal to Vt.

All that remains to be done is to transfer the vector Vt to the glass needle, whose point is to indicate the future position of the airplane A. The rotating movement of the button V_4 is transmitted to the glass needle, which has the effect of lowering the needle from its vertical position a_0A_0, a position which it occupies for V$t = 0$ (Fig. 8). Let us call ω the angle through which the needle turns. This rotation would have the effect of lowering the

point A above the plane of altitude h; this lowering is corrected by raising the center of rotation of the glass needle by $a_0a'_0$. Let a be the length of the glass needle I, and we get the following relation:

$$\omega = \text{arc sin} \frac{Vt}{a}$$

and

$$a_0a'_0 = 2a \sin^2 \frac{\omega}{2}$$

ω may be determined as a function of Vt by some mechanism or device or by a cam; $a_0a'_0$ may be determined from ω by a cam.

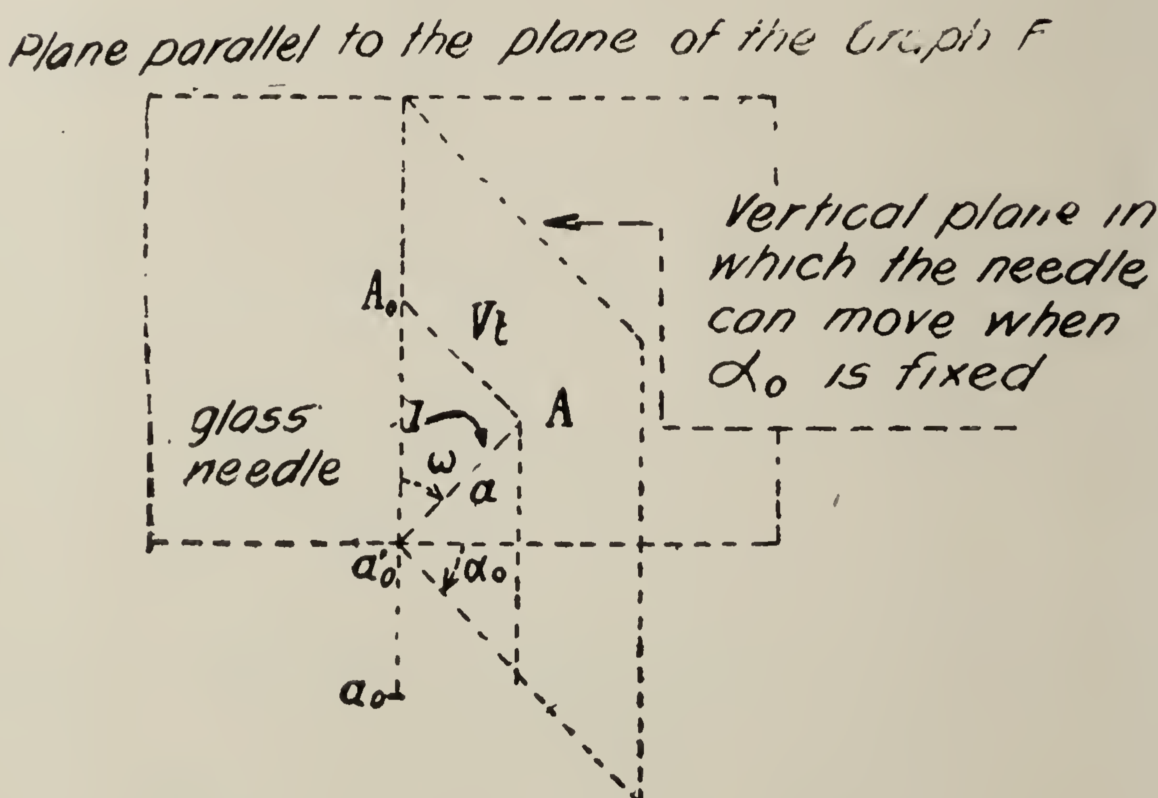


Fig. 8. Transmission of the Vector Vt to the Glass Needle

Figure 9 shows the glass needle on its base. The screws 1, 2, and 3 are bearing and adjusting screws for holding the needle in place. At the bottom we can distinguish two conical pinions, one of which serves to move the needle in direction in order to place it in the desired plane of orientation; the other is used to lower the needle in the plane of orientation by the angle $\omega = \text{arc sin} \frac{Vt}{a}$ and at the same time to show its origin of $a_0a'_0 = 2a \sin^2 \frac{\omega}{2}$.

This solution of the principal problem, which always constitutes an essential part in any instrument for the preparation of antiaircraft fire, requires some explanation.

a. The transmission of the direction to the instruments and parts which are to receive it. The vertical plane in which the glass-needle moves, cam-shaped for the calculation of the value of Δt, is accomplished entirely automatically when the observer keeps the mobile hand of the micrometer constantly along the fuselage of the airplane. We have seen that the determination of the direction is, perhaps, not very precise because of the uncertainty governing the determination of the apparent angle of direction, but we must admit

that the transmission of the direction of flight of the airplane has been brought to a very fine point, as it is accomplished automatically and without any intervention on the part of any operator.

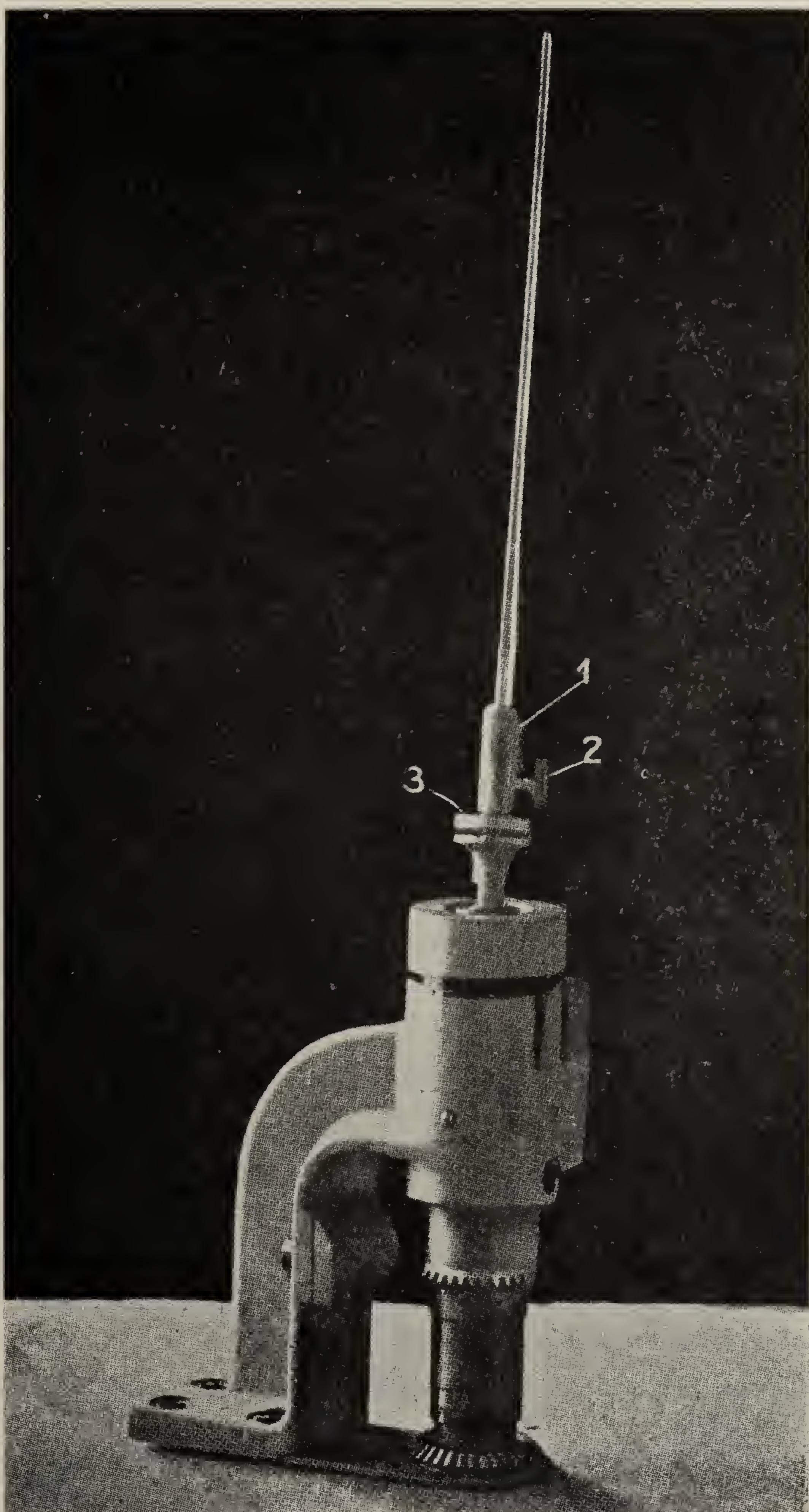


Fig. 9. Glass Needle

b. The method of taking into consideration the dead time is correct. This time varies according to whether the fire is direct or indirect; the instrument is constructed for a dead time of ten seconds for direct fire and a dead time of

five seconds for indirect fire. In order to take advantage of a dead time which may be considerable, it would have sufficed to provide for a difference in the horizontal position of the point b, around which the graph K turns; this difference would have been equal to the dead time.

As it is designed, the instrument can determine the future position of the airplane, either with a dead time zero (in which case the vertical alidade ff' is brought on the point c') or with a dead time having a value other than zero (when the inclined alidade fb_0 is placed on the point c'). This value for the dead time is, for example, the one to be used for indirect fire. For direct fire, it would have been necessary to provide a second set of curves of actual ranges on the graph K, but this complication was not adopted. For direct fire only one curve of a different color has been traced on the graph K, giving the time of flight for a single altitude $h = 4000$ meters. The resulting errors would not amount to two seconds in the time of flight of the projectile and would be disregarded as unimportant for direct fire.

c. The determination of the future position of the airplane includes a series of approximations which render it very inaccurate.

(1) $\Delta t = t - t_0$ is calculated only in a rather approximate empirical manner.

(2) The angle ϵ at which the alidade is inclined to give Δt is added to the angle ϵ corresponding to the dead time, while it would be necessary to add their tangents according to the construction.

(3) Lastly, the operator determining the future position of the airplane must make a series of readings, of extrapolations of graphs, of prolongations of lines, and of locations of the alidades on the intersections of curves and alidades, which appear complicated and difficult to execute with precision.

A number of difficult operations have been placed on the shoulders of one and the same man. It would have been better to apply the principle of division of work or the principle of the use of mechanisms. In the first case, we would have several operators, each of whom would have to perform simpler operations; in the second case, the number of operators would remain the same, but the operations would be simpler, thanks to the aid of automatic divices which would do some of the operations now performed by men.

(4) The solution does not include any reaction between t (or Vt) and Δ; it is therefore a solution of the type known as a "direct solution," which cannot make any claims to accuracy.

Whether well or badly determined, the future position A of the airplane is defined in the apparatus by the end of the glass needle I.

IV. Secondary Problems

The secondary problems of the preparation of antiaircraft fire include the calculation of aerological and ballistic corrections and the problem of parallax. None of these problems have been solved by the instrument, excepting the problem of the wind.

The Problem of the Wind

The instrument takes into consideration the *action of the wind on the airplane.*

The ground speed varies with the amount of the wind, and, for a given wind W, it varies with the direction of the air speed V with relation to the wind. For a given wind W, the ends of the ground speed vector are distributed on a

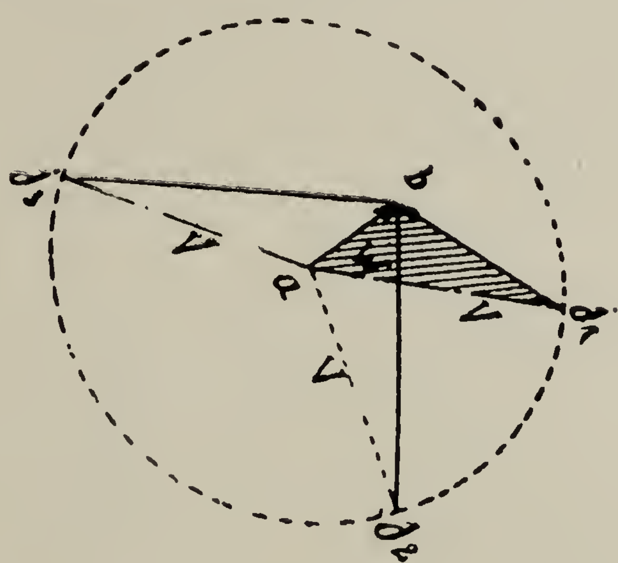


FIG. 10. SKETCH REPRESENTING VELOCITIES WHEN THE SPEED CHARACTERISTICS CHANGE DIRECTION

circle having as center the origin of the vector W and as a radius V. The values of the ground speed vector are bj_1, bj_2, etc. (Fig. 10). The triangle of the speeds is therefore presented in the instrument as in Figure 11. The value V is obtained once for all, as is also the vector W, in size and direction. The direction of the arm *ab* should vary with the variation which the path of the

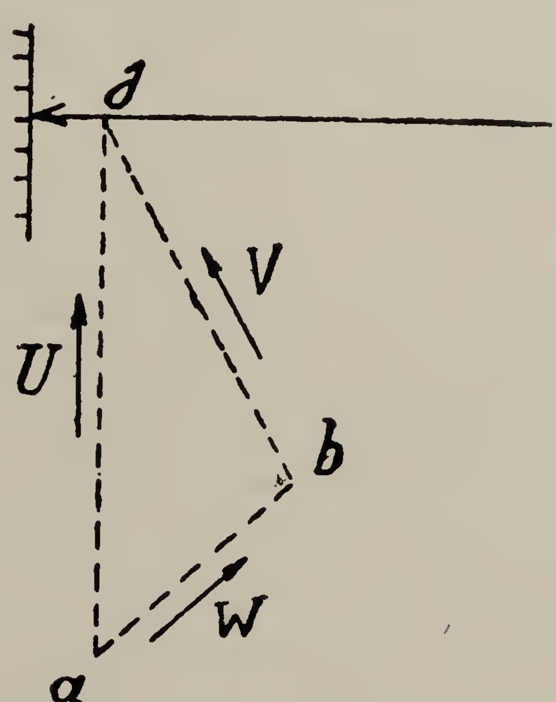


FIG. 11. SKETCH OF VELOCITIES

airplane makes with a direction of origin. This angle is equal to the algebraic sum of the azimuth and the angle of path. The arm *ab* will therefore be connected to the movement of the apparatus in azimuth and to the reticule *R* through a differential.

The amount of the wind W and its direction are measured on a cloud or on a shell burst, as with the tachyscope.

The instrument also takes into consideration the *action of the wind on the projectile.* It has been assumed that this action is interpreted by a theoretic wind W_p opposed to the real wind W which acts on the movement of the airplane. The triangle of the speeds then is represented in Figure 12.

The scale of the true speeds is then connected to the point *c.* The fixed point, the origin of the velocity definitely introduced into the instrument, is the point *a.* The vector W_p is considered as constant; thus we get quite a bit away from reality.

Figure 12 gives the mechanism with which the triangle of the speeds is obtained.

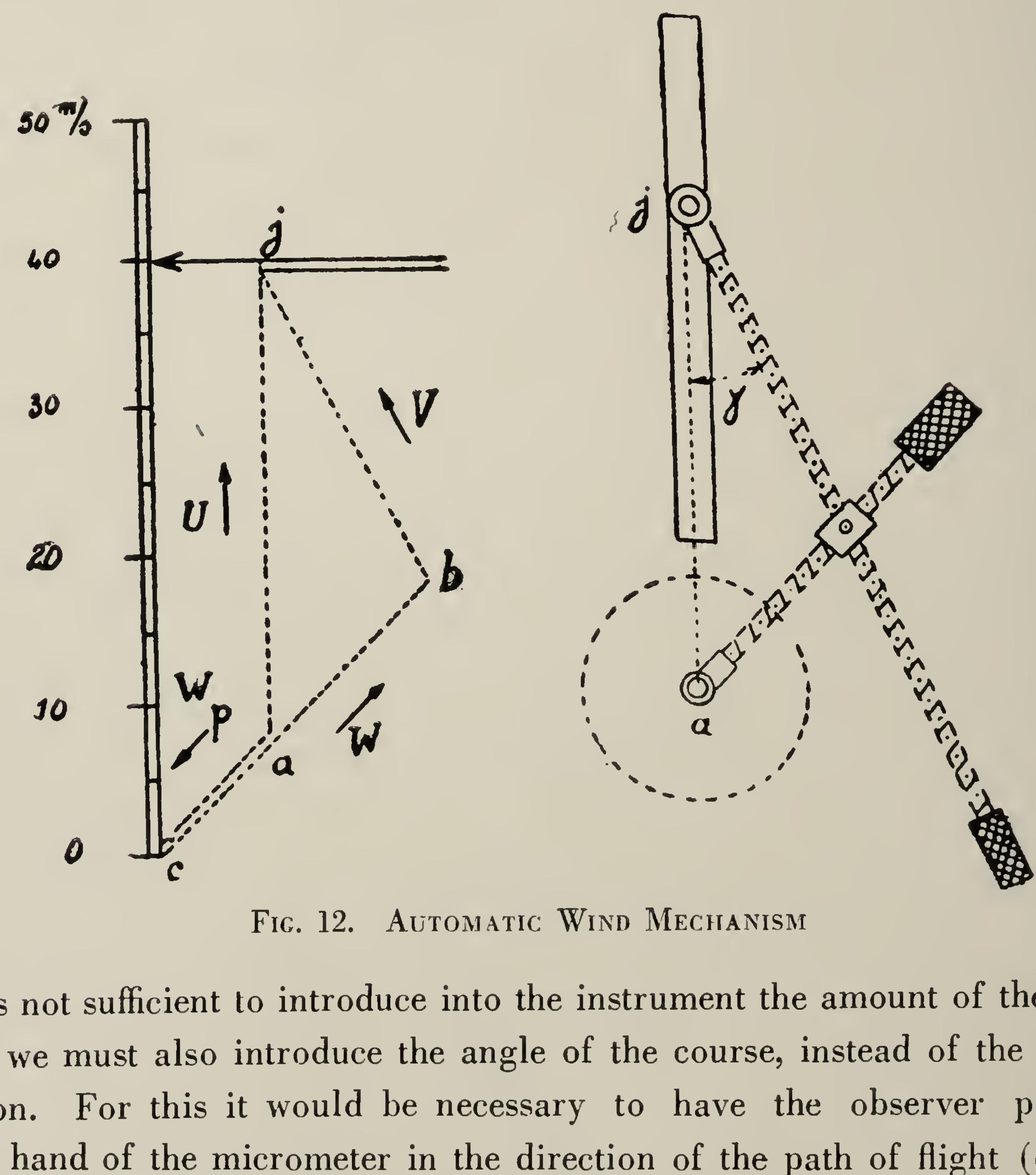


FIG. 12. AUTOMATIC WIND MECHANISM

It is not sufficient to introduce into the instrument the amount of the ground speed; we must also introduce the angle of the course, instead of the angle of direction. For this it would be necessary to have the observer place the mobile hand of the micrometer in the direction of the path of flight (direction for the ground speed) and not in the direction of the fuselage (direction for the speed in still air). This solution does not appear to be possible, as the observer does not have any means for knowing the direction of the path of flight. If the observer places the movable hand of the micrometer in the direction of the fuselage, he gives the angle of direction, and he must add to that angle, with the proper sign, the angle of the path of flight and the air speed. This angle is marked γ (Fig. 12) in the triangle of speeds. It is not certain that this addition is accomplished in the instrument; in this case there

would be confusion between the angle of direction and the angle of the path of flight.

The horizontal alidade of the speeds *ec* (Fig. 5) is connected at the point *j*.

V. The Firing Data

The firing data are—

a. In direct fire: the correction for deflection in the plane of site, the site correction, the elevation, and the fuze setting.

b. In semi-direct fire: the deflection correction, the inclination, and the fuze setting.

c. In indirect fire: the future azimuth, the inclination, and the fuze setting.

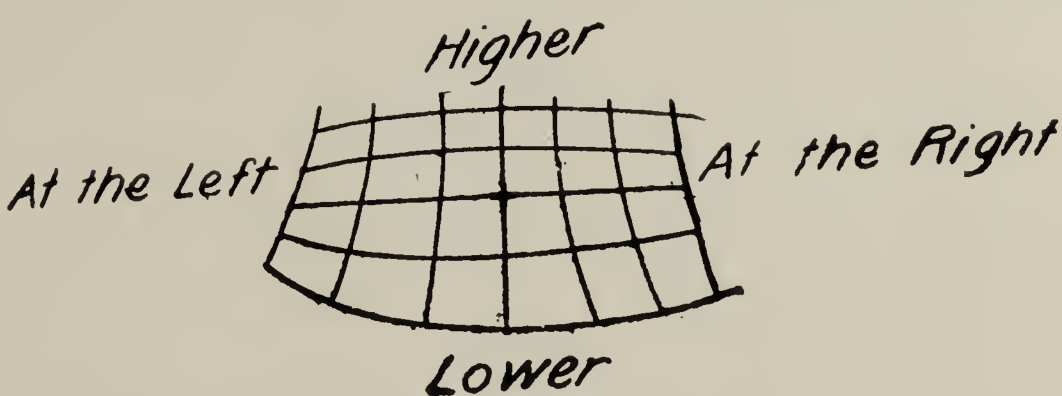


Fig. 13. Micrometer of the Reading Glass S

The deflection correction and the site correction for direct fire are taken in the deflection system known as "in the plane of site." They are read off in the reading glass S (Fig. 17) which makes it possible to examine the end A of the glass needle I on the micrometer having the form indicated in Figure 13.

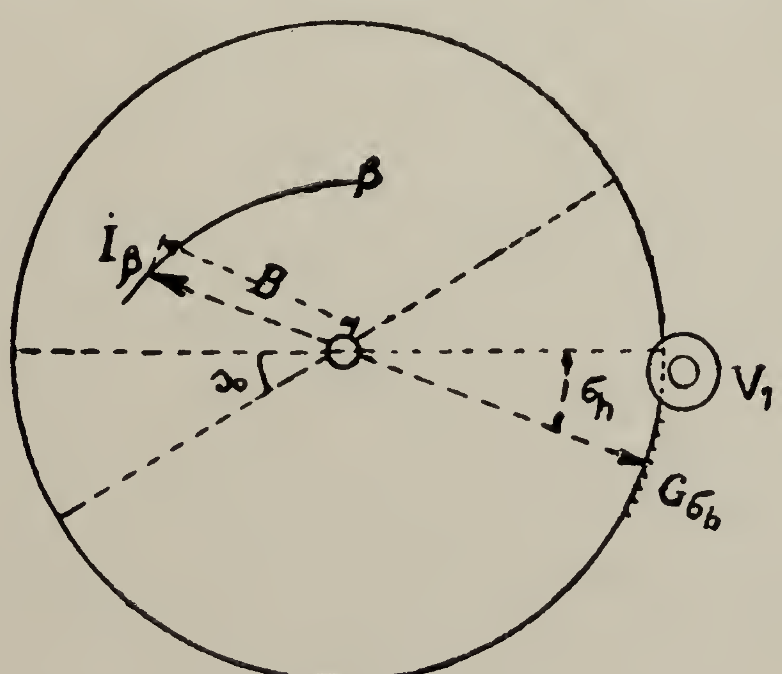


Fig. 14. Calculation of the Elevation

As in the German tachymeter, model 1916 (*Auswanderungsmesser 1916,* or *Am. 16*), the curvature of the graduated curves of the reticule ought to increase with the angle of site, but it was not desired to place on the reading glass S the complicated operating system and micrometer of the German tachymeter (*Am. 16*). A micrometer graduation corresponding to an average site, which constitutes a cause of considerable error, was selected.

The elevation is read off on a device T, placed opposite the face CD on the instrument (Fig. 17). The graph graduated in elevation graduations B turns in the present site by the direct control of the pointing triangle U of Figure 3. The method of controlling the site may be seen in Figure 17. A button or milled head V_7 makes it possible to add the site correction to the present site; this is done by rotating the index pointer I_β (Fig. 14). Moreover, the distance to the center of the index I_β is proportional to the fuze setting B. It may be seen that it is easy to read off the elevation opposite the index pointer I_β.

The fuze setting is read off on the graph of the trajectories F (Fig. 17). Figure 15 shows the operating mechanism of the graph of trajectories F. The button V_3 is to inscribe the altitude; the button V_2 is to point the instrument in site, acting on the horizontal range.

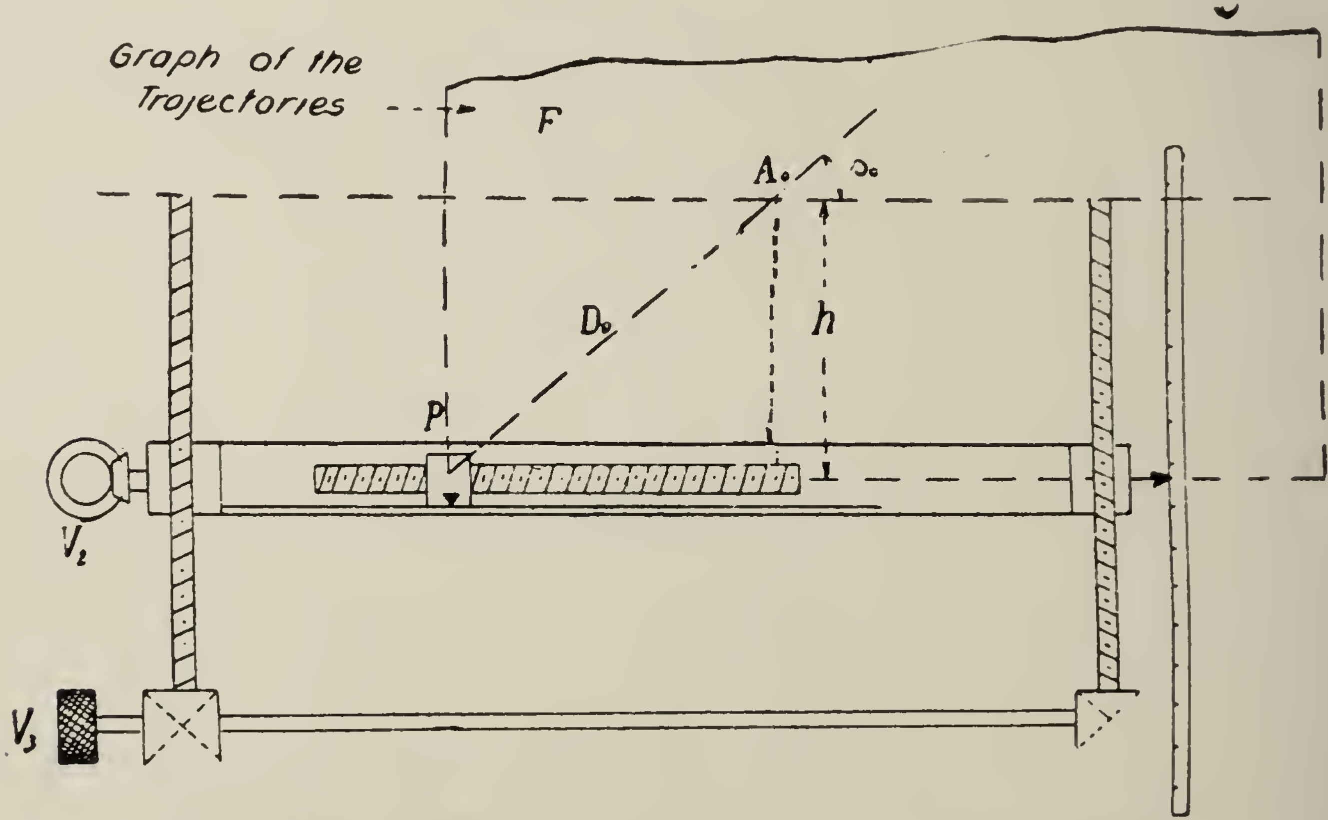


FIG. 15. MECHANISM FOR MOVING THE GRAPH OF TRAJECTORIES

The graph shows the trajectories and the curves for equal fuze settings on the scale of 1:40,000. The fuze setting is read off on the graph of the trajectories opposite the end A of the glass needle I. In order to avoid errors in parallax, which might be very great, since the end of the glass needle I may be removed very far from the graph F, a vertical mirror *mm′* is placed in the vicinity of the horizontal plane where the end of the glass needle I moves. These arrangements facilitate operation; before proceeding to the work of making the readings, the operator should move until he sees the image of the needle in the mirror move above the needle itself.

Like the fuze setting, the inclination is read off on the graph F, opposite the point of the glass needle and the same precautions are taken. Attention is called to the fact that the reading of the fuze setting and the inclination are a little off, because the point A is projected on the graph, instead of being transferred to it, by rotation around the vertical line through the point P which represents the piece. The error is zero for an airplane which is coming toward or going away from the operator, but it may be more than 100 meters when the line of flight is transversal.

This error is cancelled by automatically adding to the measured direction a quantity which corrects the error; the vertical plane of displacement of the glass needle therefore is slightly modified in relation to the measured direction.

The azimuth for the future position of the target is read from the cylinder E, which is at the bottom of the instrument (Fig. 17). Figure 16 gives the details of the cylinder as constructed. The index *k* moves vertically as a function of the present site of the target. This movement is obtained by a cylindrical pinion connected to the graph K, the index *k* bearing a toothed rack engaging with the cylindrical pinion wheel. The cylinder has curves, graduated in deflection correction, of the deflection system known as "in the plane of site." The cylinder E may move around its axis, with the aid of the handles (Fig. 17),

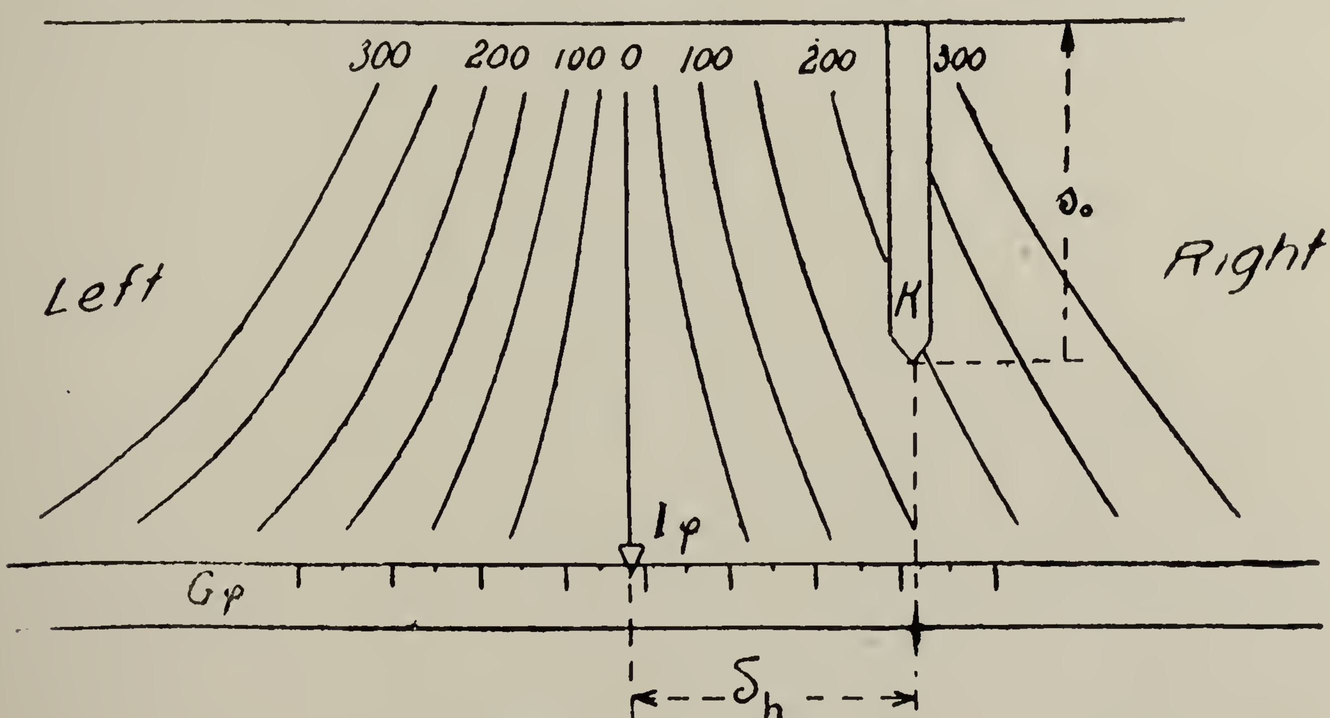


FIG. 16. FUTURE AZIMUTH

so as to bring the desired curve before the index *k*. When this operation has been done, the future azimuth may be read opposite the index I, on a graduation G_{φ}, which is stationary in relation to the base of the instrument.

The calculation of the firing data introduces new errors:

a. The corrections for deflection and site are determined only very approximately.

b. The determination of the elevation does not introduce new errors excepting the errors in σ_h and B, beginning with which the elevation is determined.

c. Errors in reading the parallax are greatly to be feared for the readings for *i* and B made at the end of the glass needle. The reading mirror gives a means which does not seem very effective when it comes to eliminating completely the errors.

d. The errors in the projection of the point A on the graph are corrected only by an empirical process which permits a part of them to remain.

e. The calculation of the azimuth for the future position of the airplane still retains some error because of the fact that the vertical index *k* moves in the site of the present position of the airplane, and not the site of its future position, as it would have to do.

VI. The Operation of the Instrument

Operator No. 1 (observer) takes position at the telescope, facing the target. Operators Nos. 2 and 4 take position to the right of No. 1, opposite the open face of the instrument. Operator No. 3 takes position to the left of No. 1 and in front of the graph showing the elevations.

The following table sums up the functions of these operators (see Fig. 17).

MEASUREMENTS AND INTRODUCTION OF TELEMETRIC DATA

Operator	*Datum*	*Operating parts*	*Graduations and index*	*Remarks*
1	s_0	V_2	Center of the fixed micrometer of the telescope L.	s_0 is taken by the use of the horizontal range Δ_0 (see Fig. 15).
	a_0	V_1	Mobile hand of the micrometer of the telescope L.	
3	B		Index I_β	Figure 14.
	δh	Cylinder E	G_φ	
	σh	V_7	$G\sigma_h$	
4	h	V_3	G_h	
	V	V_6		
	W	V_5		
	Vector Vt	V_4	Gvt	
			Readings	
2	B		A	
	h		Micrometer of the reading glass S	
	σh		ditto	
	i		A	
	s_0		Upper edge of M	In case of need.
3	β		T	
	ϕ		G_φ	
4	U		Gv	In case of need.

All these measurements and all these readings are not made simultaneously; that depends upon the method of fire selected. Summed up below are the functions of the operators in the different operations to be executed by the instrument.

a. Marking the range to the present position of the airplane.

The telemetrist measures the distance to the present position of the airplane and announces it at intervals. During this time the observer follows the target

with his telescope L. No. 4 turns the button V_3 in order that the range D_0 announced may be inscribed at GD_0 on the disk H.

b. Measuring the speed of the airplane.

The observer (No. 1) follows the airplane and gives the direction of flight with the use of the mobile arm of the telescope L, which is operated by the button V_1. No. 4 marks the present range as described in the preceding paragraph. At the moment when the speed is measured, No. 1 stops the instrument and, with the aid of the chronometer Q, measures the time it would take the airplane to cross the segment of 180 meters, marked off by the first cross line on the micrometer. No. 4, by actuating the button V_6, introduces on the graduated arc Gv the ground speed read from the chronometer Q.

The work of measuring the velocity or speed interrupts the preparation of fire.

The work of measuring the velocity of the wind is accomplished in a similar manner, sighting on a cloud or the burst of a projectile. The wind velocity is marked by the aid of the button V_5.

c. Direct fire.

The telemetrist announces the present ranges.

No. 1 (observer) follows the airplane in azimuth (general movement of the instrument) and in site (button V_2); he places the mobile radial hand of the micrometer along the fuselage of the airplane.

No. 4 sets the present range (see *a*); he operates button V_4 in order to place the point c' so that the prolongation b' of dc' falls constantly on the curve of the graph K, referred at the range D_0, marked at GD_0.

No. 2 reads off the fuze range opposite the point A, the end of the glass needle.

Then No. 4, operating button V_4 once again, places the point e so that the prolongation b' of dc' corresponds to a special curve on the graph K, marked at the fuze range B, which has just been read. When this has been done, he reads on the squared micrometer of the reading glass S the correction in deflection and in site.

No. 3 places the index I_β at the fuze range ordered; he marks the correction for site with the button V_7 and reads at I_β the angle of elevation β (see Fig. 14).

Nos. 1 and 4 verify the speed of the airplane at certain instants.

Whenever operator B_4 sees that the range D_0 marked at GD_0 moves away from the range D_0 announced by the telemetrist, it is because the airplane has changed its altitude. Operator B_4 reestablishes the agreement by modifying the altitude with the aid of the button V_3. He should use judgment in changing the altitude, so as not to introduce the result of the oscillations of the monostatic range finder into the instrument.

d. Semi-direct fire.

(1) 1st Variant. The values of δ, i, and B are sent to the guns.

The telemetrist operates as he usually does. The speed is measured as for

direct fire. No. 1 (observer) has the same functions as when executing direct fire.

No. 2 reads off the fuze setting and the inclination at the end A of the glass needle.

No. 4 has the same functions as he does when executing direct fire; he operates the button V_4, sometimes at c' for reading B, and again at e. He reads off δ and σ.

(2) 2nd Variant. The data δ, h, and B are sent to the guns.

In this case, the fuze setting is read as for the first variant. At the same time No. 2 reads off the value of h. δ is read off by No. 4.

This variant requires that the pieces possess an inclination sight making it possible for them to calculate i as a function of h and of B.

e. Indirect fire.

The following data are sent to the guns: ϕ, i, and B.

The operations performed by the telemetrist, the part played by No. 1 (observer), and the measuring of the velocities do not change at all.

No. 4, with the aid of the button B, keeps the point e' constantly on the straight line db', b' being defined by the range D_0 marked at GD_0. Moreover, every time the vector Vt varies and at every change in direction of the airplane, No. 4 reads the deflection correction in the reading glass S and reports it to No. 3.

No. 2 constantly reads off i and B immediately underneath the end A of the glass needle.

No. 3 operates cylinder E in order to place the reported deflection correction in front of the vertical index k, and reads the azimuth opposite the index I_φ on the graduated scale G_φ.

An examination of the functions performed by the different operators brings out several important points:

a. Each of the operators has a great many functions to perform. In indirect fire, No. 2 is to read off the values of i and B, two data which may vary rapidly. It sometimes even occurs that the operations performed by two men are connected, coming one after the other, like those of Nos. 2 and 4 in direct fire, with the alternative operation of knob V_4 first for the calculation of the fuze setting, then for the calculation of the deflection and site corrections. It may also happen that one operator has one or several operations to perform before he reads off his data, like No. 3 in the execution of direct fire (the reading of β) or in indirect fire (the reading of the value of ϕ).

It seems that too much is required of the operators; the multiplicity of the operations required certainly spoils the precision of all of them taken separately.

b. The instrument has certainly been designed for indirect fire, and it was only after it had been completed that it was adapted to use for direct and semi-direct fire. The functions of the operators in these last two methods of fire are, as a matter of fact, much less natural than the functions of the operators in indirect fire.

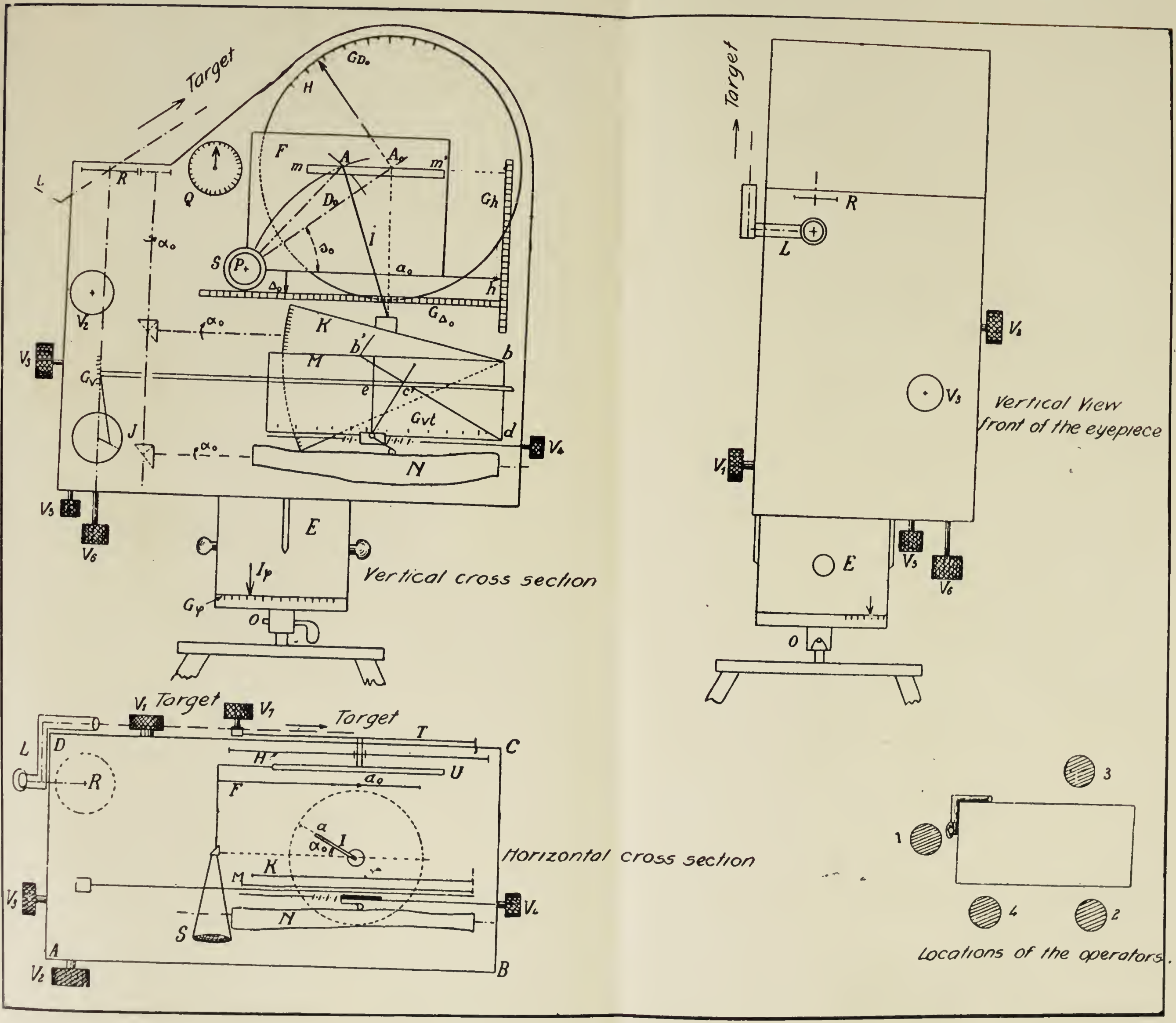


Fig. 17. The Schonian Instrument

c. The Germans have always shown a certain dislike to the use of the altitude. Here the altimeter is separated from the range finder and included in the fire-preparation instrument. If the range finder furnished the data for the altitude, the functions of No. 4 would have been very greatly simplified; he would have been relieved of the trouble of examining the agreement between the ranges D_o reported by the range finder and the ranges D_o marked at GD_o. Moreover, the curves on the graph K might have been graduated in altitude, a coordinate which varies much more slowly than the actual range D_o.

The reason for this ostracism of the altitude may perhaps be the fact that this coordinate cannot be utilized at low sites. But here, since the instrument enjoys the valuable characteristic explained above, namely, that the linear coordinate may be either the real range or the altitude, it would apparently have been wiser to choose the altitude and to use the actual range for small sites.

SUMMARY

The brief description just given of the Schönian instrument shows that it has serious defects:

a. The operation of measuring the speed of the airplane, which operation is intermittent, interrupts the operations of preparation of fire.

b. The solution of the principal problem is not precise.

c. The instrument cannot make corrections in parallax nor corrections in inclination, nor ballistic or aerological corrections (excepting those for the wind).

d. The instrument is deprived of the advantages given by the use of the altitude for the solution of the principal problem.

e. The operators are few, but each one of them has to perform numerous and complicated operations.

f. Lastly, the instrument is fragile and its transportation and manipulation require great precautions. The glass needle, transported separately, must be put in place and adjusted at every setting up of the instrument; this adjustment is apparently a long and delicate operation—a very serious fault in an instrument to be used in the field.

But it is well to place the advantages of this instrument beside its faults:

a. Aiming at the present position of the airplane is executed with an aiming triangle in which the geometric elements are proportional to their actual size. Thus it is possible to fire by altitude, actual range, or horizontal range, as desired.

b. The instrument measures the direction and transmits it, without the need of reading, in a particularly excellent manner; the direction of flight in a straight line is kept up to the minute without the intervention of the operator.

c. The optical solution of the tachyscope for measuring the speed is excellent.

d. The automatic calculation of the ground speed, which takes into consideration the action of the wind, when the airplane changes direction, is also to be retained.

Lastly, in order to give a fair estimate of the instrument, we must consider that it was designed as far back as the end of 1916 and that it was at that time a complete instrument for antiaircraft fire preparation suitable for use for both direct and indirect fire.

Such as it is, it merits the study of antiaircraft artillerymen who are interested in knowing how other countries, during the war, solved the difficulties peculiar to antiaircraft fire.

This movement against military training is part of a wide-spread and consistent plan to destroy the military defenses of the United States—her Army and Navy—and all that might contribute to their personnel and their efficiency. It includes the Citizens' Military Training Camps, the University and High School drills, and it has even marked the Boy Scouts for destruction, as whispers of "militarism" about them are in the air. Finally, the flag will be pulled down from our school houses, as being too suggestive of war and too intimately associated with patriotism. This is the program; and many unsuspecting persons are being swept into the current. Every established government is being assailed today.—Rev. Marion D. Shutter.

The Training of Reserve Coast Artillery Officers

By Lieut. W. W. Daly, 211th C. A. (Mass. N. G.)

Editor's Note.—*The writer has served as an enlisted man and as an officer in the Old Militia and National Guard before the War, in a regular army unit during the War, and subsequently as a Reserve Officer and National Guardsman. He has been a C. M. T. C. instructor and has had various close associations with the R. O. T. C. as it is at present constituted. Some of the ideas, therefore, expressed in this article, are based on experiences which, while personal, have been sufficiently general to give a basis for sound deductions.*

CERTAIN fundamental facts seem to be generally agreed upon by our military historians.

a. Trained and disciplined American troops have always given a good account of themselves.

b. Units of long standing can absorb many raw recruits and still keep up their morale and the greater part of their efficiency.

c. A small nucleus of trained troops is an absolute essential, because around this can be built a much larger force.

Probably one further observation can be made. Trained, efficient officers can be expected to take over groups of recruits and in a comparatively short time weld them into an effective military unit.

With the present condition of our Regular Army and National Guard, and the obvious tendency toward increased efficiency in the latter, it becomes more and more apparent that there are many things which may be done toward rendering Coast Artillery National Guardsmen more effective in the event of an emergency. In developing the National Guard for such an emergency, the writer feels that much may be accomplished beyond what has already taken place if a policy is adopted having in mind the utilization of our present peacetime units.

During the World War many units went overseas at the time of our first entry into the war, containing men who were probably better officer material than could have been obtained in any of the training camps. Many of these men served through the War as noncommissioned officers or as privates when they would have been much better employed in more responsible capacities.

One of the most regrettable features of the first few terrible months of England's share in the war was the manner in which some of their finest young men were utterly wasted, with the result that less desirable officer personnel came to be relied on later, in the closing year of the conflict.

In the same way it should be a matter of grave concern whether it might not be possible again that our army would lose the services of the younger men who were distinctly officer material, but who preferred in peace time to remain in the ranks. As it has been true in the past that many good potential officers were used in the enlisted grades, so it might take place again unless care were taken to prevent just such an occurrence.

It is my thesis here that, with a minimum of expense and with little or no change in our existing establishment, these men could be so located and trained that in time of war they would be of much greater value to the military establishment. In addition, such a plan could call into being a sufficient number of reserve officers so that our skeleton units could be constantly maintained, not only at a higher state of efficiency, but also as more effective nuclei around which to build future armies.

The mission of Coast Artillery, as laid down in General Orders, is the manning of our heavy armament on our coast. It has come to include the four distinct divisions of harbor defense, railway, tractor, and antiaircraft artillery. In the event of another emergency there would be an immediate need for a considerable number of trained, or at least partially trained, officers for supervising the handling of this armament. It is, consequently, a very pertinent question, in considering the mission of coast artillery, to examine the methods by which such officers are now being secured, can be secured in the future, and how they might be secured in an emergency.

We have at the present time C. M. T. C. and R. O. T. C. units, both of which send in to the Officers' Reserve Corps every year a few junior officers. The number, however, is probably barely more than enough to take care of the normal replacements for the older officers who are dropping out of the service. Furthermore, these younger officers, while possessing a certain degree of skill and understanding of the technique of coast artillery, do not possess the general knowledge of the service and the experience in handling men that would be expected of them if suddenly called into active service.

Their greatest weakness, furthermore, is not now being strengthened in the summer tours of duty, as the programs of these tours are usually concerned with basic artillery and not with troops, the handling of men, and the ordinary daily routine of soldiering. An older officer in the regular service, who has seen much of the Reserve and the Guard, once summed up the entire case for both in a sentence: "The Reserve Officer is probably better trained in the technique of artillery than the Guardsman. He lacks, however, the experience in handling troops, and given a battery, he would hardly know what to do with it."

In discussing the present military policy of the United States in relation to the training of emergency officers, we see that notable steps have been made in the establishment of a definite policy under the National Defense Act of 1920 with its subsequent amendments. We also have the comparatively new organization of the Officers' Reserve Corps, which would supply the nuclei around which the reorganized militia would be built into an effective fighting unit.

The old feeling that once existed on the part of the officers of the regular establishment toward the "citizen Officers," that the Guardsman and the Reserve Officer were "only volunteers," has, in the opinion of the writer, almost entirely disappeared. Guardsmen and Reserve Officers now mingle socially and otherwise with their brothers in the regular service to a degree that would

have been inconceivable twenty or thirty years ago. This is due in part to the fact that many of the present regular officers were themselves civilians before the World War. It is due in part to the fact that under the National Defense Act the type of officer in the National Guard is a great improvement on the old time Militia Officer. It is due, probably more, however, to the definite attitude of each toward the service; on the part of the regular Army Officer to his realization that those who play at soldiering have made it a hobby and a study, and on the part of the amateur, that he can learn much from the professional.

We still have, however, a distinct problem. In the event of an emergency, we must have a much larger number of emergency officers than is in sight at the present time. This, to a certain extent, will be taken care of by such production methods as were in vogue during the last emergency, when selected young men were sent to the Officers' Training Camps and then to the special schools at Fort Monroe and elsewhere.

Such a method, however, should not be employed if it is possible to avoid it as it smacks of the old idea, so evident in our early conflicts, of not preparing for anything until preparation was forced upon us and then muddling through at a terrific cost of blood and treasure.

* * * * *

This problem of training in peace-time Reserve Officers, who in time of war will be able to function adequately, shows at the start three distinct aspects:

a. It must be done at a minimum of expense.

b. It must employ existing agencies, rather than set up new bureaus.

c. It must not interfere with the regular, ordinary, peace-time missions of the units involved.

In addition, it must be sufficiently flexible so it can be easily expanded at any time to meet an emergency and train a large number of officers in a brief period. It must not be inconsistent with any emergency plan, such as the R. O. T. C. of 1917-19, but rather must aid and supplement it. It must, finally, be capable of turning out officers with a reasonable degree of skill, who will be able to function without any hiatus, and who in turn will be able to train others.

It is unfortunate that in many cases the Officers' Reserve Corps at the present time is in a state which may be described as sour. It has been the writer's personal observation that many officers, particularly those of field rank who served during the war, and who for a number of years following the war were active in the Reserve Corps, have, nevetheless, left the service, either by allowing their commissions to lapse or through resignation because of lack of adequate means of preserving their interest.

This is not a reflection on some of the excellent members of the regular establishment who are trying to keep up interest in the Reserve Corps; it is rather because of a fundamental feeling that paper reserve units have been allowed to become more and more paper and less and less units. In one instance an officer commanding a unit, developed a considerable feeling of esprit

and interest by holding frequent meetings of his officers, in which problems were discussed, and in which various methods of troop handling were considered. Plans were made for developing the unit more and more to the place where it would be an effective nucleus around which a regiment could be built, but department orders required the transfer and breaking up of this organization, with the result that valuable officers left the service, chiefly, it would seem, because of a lack of any function which they could perform.

As regards the younger officers who have entered the Reserve Corps since the War, there is little opportunity for them to get any systematic training with troops. Rarely does it occur that a reserve officer can go into a National Guard organization and work with them. The majority of camps for Reserve Officers held during the summer are productive of a certain amount of basic training, and it is only for two weeks, during which time the officer may become slightly familiar with one type of armament, but has little or no contact with troops.

It is definitely established in the Manchu Law that a regular officer must serve a large proportion of his time with troops, but there is no provision at present for similar training for the reserves. It does occasionally happen that a reserve officer is appointed to work as instructor at our R. O. T. C. or C. M. T. camps, but in such case, it is dangerous to detail any but an experienced officer, as the juniors who have just come out of such units are themselves not in a position to be of great value. The only officers who are really effective in such units are those who need the training least.

At the present time we have two general methods of providing Reserve Officers—the C. M. T. C. and the R. O. T. C. units. Both of these are effective to a certain limited extent. In each of them, however, the number of men who start in the Freshman Year in the R. O. T. C., or the basic C. M. T. camp, in no way resembles the number of men who attain commissions. The casualty list is very heavy—probably in the vicinity of 80% to 90%. Of course, the R. O. T. C. students are a selected group to begin with, because those who attend such colleges are themselves a selected group, and it is frequently the athletes and the more virile men among the students who take courses offered by the various departments of Military Science. Similarly, those who are attracted to C. M. T. camps are frequently the best young men in their community, and the selective process is going on with each college year or each camp.

For the number of men who complete the course and receive their reserve commissions, however, there are many young men who would make excellent officer material who fall by the wayside. While the requirements are probably not difficult, they are frequently too difficult or too technical for the young man unfamiliar with the service to comprehend. The result is a tremendous wastage of officer material, which, with a proper method of tying up one unit with another, could be salvaged to the extent of obtaining almost all of the men desired for the service.

Training Reserve Officers, or training civilians or part-time soldiers to become Reserve Officers, in order that they may function effectively, may be divided into four separate sections:

1. It must cover the technical training necessary to the arm. For the Coast Artilleryman it must include:

a. Basic gunnery and fire control.

b. General materiel, explosives, and the like.

c. Special training in all of the details of one of the four branches of Coast Artillery.

d. A general knowledge of the other three.

2. A training in administration—that is, the routine duties of an officer in the Army of the United States. This would include military paper work and correspondence, military organization, and such other subjects as are necessary for a battery officer. It should include any general information which would enable him to function in any capacity in which, as a battery officer, he might be detailed.

3. Probably one of the most difficult to describe is personal training. This would include the habit of the exercise of command, which ordinarily can be achieved only with years. It may, however, be built upon the civilian habit of control so that the man who is a sales manager, office manager, or shop foreman may bring to the military service the qualities which he has developed in civilian life. If the proper methods are followed and men who are accustomed to exercise the habit of command are gradually drawn into the Reserve Corps, the years of practice will be greately lessened. This drawing in of the proper men is a recruiting "sales" proposition which later will be covered.

4. The training in general military subjects which are common to all arms, including map reading and sketching, military law, logistics, health, hygiene, sanitation, military policy, and other matters technical in their nature, with which every officer should be familiar or with which he should have a bowing acquaintance.

In the organization and development of a method whereby new officers can be secured and a steady reservoir of material built up, it is obvious that some method must be obtained wherein the National Guard and the R. O. T. C. can be used to the great benefit of both. It is such a method that this paper suggests. We have in the National Guard today many real and efficient officers. In many cases we have enlisted men who are officer material, and more can be secured. Most National Guard units, in fact, derive the greater part of their commissioned personnel from the enlisted ranks. College men, particularly, find the National Guard an outlet for their social energies and most of the younger officers in many units today are college men who have come up through the ranks.

In the Adjutant General's circular of March 22, 1928, the provision was made whereby enlisted men in the National Guard might secure commissions in the Officers' Reserve Corps by passing suitable examinations and tests, a part of which might be waived in the case of men who have taken courses in the Army Correspondence School. By using a method of this sort, it would be

possible to take men into the National Guard, give them their basic training in the course of a year or two years, and then have them take such correspondence courses as would fit them to be capable and efficient reserve officers in the case of an emergency.

The four types of training referred to above could very well be taken concurrently. If the gun drill and the normal routine work could be learned in the battery, the candidate could learn both the fundamentals of his technical training and the routine which is covered under the general heading of "Customs of the Service." He could, once he received the basic training, go into the Army Correspondence Schools, and there secure the additional information and theoretical training which are so necessary, once he goes into the field and puts his theories to practice. If he has the theories and has basic practical training, he will, under normal circumstances, be an efficient officer. If he lacks either one—the ground work or the theory—his superiors will find him lacking.

Such a course of training would normally take three years—the ordinary term of enlistment in the National Guard. In his first year he would learn what the military profession has to offer him. In the second year he would be attending a noncommissioned officers' school or similar form of training, and in his third year he could, without great difficulty, complete the required correspondence course which would enable him to qualify as a Second Lieutenant. Once having received a certificate of capacity or a reserve commission, he could carry on in his unit, taking a more advanced course which would qualify him for a higher grade. Over a period of two additional years he could complete his requirements for the next grade, and his increased interest would bind him more and more closely to the military service. He could function as an additional officer with the regiment, without pay, to be sure, but nevertheless assist in the performance of a large number of duties which fall to the National Guard organization; or he could go into a reserve regiment and become an active member of it. In any event, the advantages of training would be tremendous, both to him and to the organization which is served.

* * * * *

Now let us consider for a moment the effects of such a program. In the first place, the National Guard unit which was employed as a training school for reserve officers for a three-year period would find a material improvement in its personnel because men would go into it with much more earnestness, and the result would be a greater efficiency. Not only would the type of personnel be improved, but the unit would gain numerically, for again the social contacts which are so much a part of National Guard life would be enhanced, and other men who perhaps would not work for a reserve commission, but rather because of a desire to associate with the particular individuals who would, would join and partake of the National Guard work. In peace time men would consequently be performing more effectively through such units, so that the general strengthening of the existing units would necessarily result. The matter of expense would be slight. It would, of course, be necessary to have greater

facilities in the correspondence schools, more papers, and more copies of training regulations, but additional personnel would not be necessary. The Reserve Officers, as they become commissioned, could, in turn, become instructors, and while fulfilling the requirement of a given number of hours in each year, would work with those coming in after them, and handle the instruction and training. All of this could be done under the supervision of Regular Army instructors, who would act as supervisors of training rather than as actual teachers. The Reserve Officers in giving this training would benefit greatly, proving the old maxim that "a man never knows a subject until he has taught it successfully."

In instituting such a scheme, certain re-arrangements would be necessary. In the first place, a closer relationship, already referred to in the introduction, with a genuine spirit of cooperation and a realization of the need for mutual helpfulness, must be built up between the National Guard and the Organized Reserve. Second, there should be a more ready method of transfer between the second and third components of the Army. The National Guard Reserve might perhaps be joined with the third component, so that when an officer in the National Guard leaves his active status, he goes not into the National Guard Reserve but into the Officers' Reserve Corps—an active rather than a moribund unit—which, while it does not require as much time as the Guard, nor entitle him to Federal pay except for camp duty, does give him a definite status.

This might necessitate changes in policy on the part of different Adjutant Generals in the States, or even in State Statutes, but it should not present insurmountable difficulties.

The greater part of the labor involved, particularly the organization work, would necessarily devolve on one or two National Guard Officers in each unit who would actually see the work done.

I have not the slightest doubt that in every State and in every Regiment there are officers capable of doing such a job, once they realized its possibilities. All officers could not do it; a few could and would. Now, in carrying out such a scheme the officer handling it would see what was necessary when he got the machine in motion. Here again we would employ existing agencies and would use facilities that are at hand. Basic training, of course, would come during recruit instruction; if men had been in attendance at C. M. T. C. or R. O. T. C. units, they would be able to start in with certain fundamentals. The N. C. O. Schools, which should be held in every unit, would serve the second phase of instruction. The Army Correspondence School's Basic Subcourses would form a ground work for officer training. During the time the man was doing all of this work he would be functioning as a soldier and learning his job. The officer in charge of Reserve Corps training should, once the method was established, generally supervise the work and conduct of this school; the course would not in any way interfere with the normal function of the unit but should be in addition to, and outside of it.

In the working out of this plan there would, of course, be a strong urge for recruiting even better men than would ordinarily be the case, and such men would be glad of an opportunity to obtain commissions in the Reserve Officers'

Corps. Some men enter the National Guard and go from there to the Military Academy. Many other men, while not caring to enter the military profession as such, would be very glad to adopt it as an avocation, and in the working out of this plan, ordinary intelligent sales methods, properly employed, would give excellent results.

Here again the work might devolve on one or two men, but I am confident that there will always be men who will undertake such work if their talents are only directed into the proper channels.

With regard to the question of what units would be used as the basis for training enlisted men in the National Guard, it would probably be advisable at the start to select one or two units in each vicinity, leaving it open to any others, who so desire, to avail themselves of this plan. Some units, obviously, would not care to undertake it; others would welcome it.

In the event of an emergency it would probably come about that certain units would show greater adaptability at training officers than others. These units could immediately serve as training groups; their officers would probably be admirably equipped to handle officer training on a larger scale, and in that way the system could be readily expanded to meet any possible need. This, of course, involves the development of certain skill and technique in the art of teaching the fundamentals of the military profession. This technique developed and perfected in time of peace, could readily be at hand to meet an emergency.

Now, as has been indicated, this method of training Reserve Officers employs existing agencies. It is, as far as can be discovered, in accordance with all of the existing regulations, and is only an additional method for procurement of Reserve Officers. Such a plan would greatly increase military interest on the part of young men. Many virile youths now graduating from our colleges and secondary schools could be attracted to a hobby which would be decidedly worth while and would give them a method of self expression—one to which they could continue to devote their energies for a number of years. They would, at the same time, be putting themselves in a position, by taking such training, that they would be of greater value to themselves and to the nation in the event of an emergency.

In the employment of these existing agencies, it is obvious that some slight expansion on the part of the Army Correspondence School might take place, but as this work is constantly going on, and constantly being improved, such expansion would be only a slight acceleration of the continued improvement. In the matter of expense to the Government, here again there would be no particular change. It is true that, as noted, additional slight cost to the Correspondence Schools would be incurred, but the question is one only of a minor degree.

In the third place, as noted, the adoption of a definite training program by a National Guard unit would result immediately in a stronger and more efficient peace-time unit through an improvement of personnel, which would obviously enable it better to perform any peace-time mission it might have.

It is probable that we shall not soon have any major emergency. If, however, one should arise and units were at hand which were available for training officers, and if other Reserve Officers were scattered about through our service who had been trained in the manner in which has been outlined, the resulting conduct of our first few months would avoid the dilemmas in which we found ourselves on previous occasions.

There are always in the United States plenty of young men who are officer material who would be interested in learning something about our service, its history, possibilities, and its organizations—if they were properly approached. This is, after all, like all recruiting—merely a sales problem which must be properly handled. If it is properly handled there is little doubt that we shall be much better fitted to meet any emergency of any sort; at the same time, we shall be building up the morale of our units and making a distinct contribution to the ancient profession of arms.

War can never be abolished by objecting to it, by requesting the abolition, or by resolutions of any body or association of bodies whatever. We might as well pass resolutions to abolish fire and flood and call on nations to do away with them. War, like fire and floods, is not a cause, but an effect. Its likelihood can only be lessened when its causes are lessened.—Rev. John W. Day, D. D.

Trenton---the First American Offensive

By Captain George J. B. Fisher, C. A. C.

ON December 25, 1776, the British occupied East and West Jersey with a force of 12,000 professional soldiers. A fortnight later Cornwallis had been forced back eastward to the Raritan, his hold on the Jerseys practically broken. The intervening days were momentous, for they witnessed the inception of American military power.

In considering the romantic rise of the United States, it is apparent that the episode of Trenton was the first smile of destiny.

When Washington struck at Trenton, he was hitting in desperation. He sensed his opponent's weakness and only hoped for that to offset his own lack of military strength. "Nothing but necessity, dire necessity," he writes, "will justify an attack." Had he been a more formal soldier he would never have risked his dwindling reputation against such unfavorable odds.

But, fortunately, Washington was more than a mere general. He had become a Zealot. The only certain way of overcoming an army so commanded is by capturing its leader. Howe realized this fact and was accordingly gleeful when General Charles Lee was brought before him; but he later saw that his dragoons had caught the wrong general. The real military leadership of the revolt had yet to be appraised.

The fortunes of the revolutionists were at a low ebb indeed when, on December 8, the ragged remnants of the thrice defeated Continental Army were chased across the Delaware into Pennsylvania. Not only was armed resistance apparently broken; the enemy occupied a position of surpassing military and political value which, if properly developed, could have easily carried the war to a far different conclusion.

At no time do the British appear to have properly valued their easy conquest of the Jerseys in 1776.

British statesmen and soldiers alike were obsessed with the idea of capturing cities, forgetting that the states were rather rural than urban and that the roots of the rebellion lay in the provinces.

When Cornwallis found that Washington had escaped into Pennsylvania, drawing after him all the boats on the Delaware, he settled his troops down at ease to wait a more favorable opportunity for attacking Philadelphia. The Jerseys he considered merely an avenue to that city.

They were, however, much more than that. Their strategic value was to be found in their peculiar geographic relation to the other revolting states, a relation which any map of the period clearly shows.

The spirit of active resistance against the Crown was at the time centered in two distinct areas: New England and Virginia. The remainder of the

colonies blew hot and cold on the idea, as these two sections stimulated them with their own fanaticism for independence.

Yet, aside from their determination on self-government, Massachusetts and Virginia had little in common; they were, in reality, more or less antagonistic. An acquaintance with Colonial politics should therefore have indicated the most favorable direction for British military action as being toward the isolation of these two revolutionary centers.

In capturing the Jerseys, this had actually been accomplished.

The main line of communication between New England and the South ran then, as it does now, across the narrow neck which connects the Delaware and Raritan rivers. In 1776 this avenue was merely a single dirt road between Trenton and Amboy. Over this passed and repassed the firey propaganda of the common cause. With this path firmly held and the coast blockaded, there was little to unite the states except a name.

Had Cornwallis, when he moved westward through the Jerseys, insisted on a reasonable treatment of the inhabitants, that section would probably have remained as loyal to the Crown as it undoubtedly was when he entered it. Instead, his mercenaries did much to antagonize and inflame the peaceful farmers and to force them to arms.

With a conciliatory attitude toward non-combatants, coupled with a reasonable military alertness, the British could have held indefinitely this wedge which so effectively sundered the American states.

Not only were the British ignoring the best strategy—they were apparently none too concerned over tactics. There is every indication that they saw, in the scattering of the Continental Army after Haarlem Heights, the end of the revolt. Even Burke, writing his impressions at the time, stated that the Americans had accomplished more than he expected but conceded that they could do little more. The same attitude is reflected in the casualness with which West Jersey was held by the British soldiery.

It was the failure of Sir William Howe to appreciate at this juncture the deadly determination of General George Washington which led to the British losing their hold on the Jerseys and which paved the way to their eventual loss of the colonies.

Seeing no need for immediate action with the remainder of the Continental Army beyond the Delaware and a cold winter already set in, Cornwallis returned to New York and was readily given leave to visit England. Command in the Jerseys fell to Major General Grant who, not being a politician, was not so likely as Cornwallis to divert from Howe the credit for the expected capitulation.

Grant established his headquarters at New Brunswick and cantoned his troops in the surrounding villages. The winter proved to be one of unusual severity; shelter was scarce, so that it became necessary to scatter out his force into a dozen towns from Raritan Bay to Burlington.

It is significant that, in disposing his troops, Grant placed his Hessian contingents along the Delaware between the British regiments and the Americans.

The reputation of the Hessians as professional soldiers was, up to this point, very high. It was evidently the intent of Grant to have them bear the brunt of the defense, leaving the English and Scotch in greater security for the concerted enjoyment of the mid-winter holidays. He intended to permit the mercenaries fully to earn their hire.

The river towns were held by Count Carl von Donop with 3000 sturdy soldiers. Remaining himself in the center at Bordentown, he sent a detachment to Burlington and a heavy force north to Trenton.

Of these three towns Trenton, commanding the Delaware river crossing, has always been the most important. Here were stationed three infantry regiments, some chasseurs and dragoons, and six pieces of artillery: 1500 men in all.

The senior of the three regimental commanders, Colonel Johann Gottleib Rahl, became acting general of brigade and assumed command of the town. This important post fell to him as a recognition of his successes earlier in the war.

Rahl is an interesting example of the type of professional soldier who performs well under an accomplished leader, but who fails when given independent command. His was the error of attributing too wholly to his own worth victories won under the leadership of his superiors. Many officers have overcome this failing through the chastening of defeat; but the shortcomings of Rahl cost him his life.

While the British Army was thus scattered among the Jersey villages, comfortably preparing for the winter, the situation of the Continental troops on the Pennsylvania side of the Delaware was far less happy.

Perplexities beset Washington on every hand. Within the army was disloyalty; the Continental Congress was hopelessly incapable of supporting an army in the field, and patriots throughout the country were disheartened by continued military defeats. The situation of the soldiers themselves was most distressing. Their clothing and shoes were outworn; they lacked food, shelter, and money. Hannibal's army in Italy was better equipped than was this handful of men fighting in the heart of their own prosperous country. Knowing these conditions, the British felt at ease.

But Howe and his subordinates failed to gauge the temper of their adversaries, a serious military oversight. They did not realize that the small force across the river had been purged by the fire of adversity; that in its defeats and retreats it had shaken off the weak-willed and the indifferent, leaving only the desperately determined. Such men as remained were the material with which a real leader accomplishes miracles. And Washington was at hand to lead them.

Feeling reasonably safe for the first time in months, Washington proceeded to do what he could toward improving his hazardous position.

He dispatched innumerable letters in every direction—to Congress, to the governors of nearby states, to influential friends, and to his subordinate generals, in an effort to increase his strength and prepare for the offensive.

The correspondence of Washington during December, 1776, indicates that his greatest concern was the prospective disintegration of his army. The enlistments of the majority of his men were to expire on January 1, thanks to the faulty policy of the government in recruiting troops for the Continental line. Yet, with supreme confidence, he proceeded to plan a winter campaign. He therefore called for militia from Philadelphia and from all the surrounding country and wrote daily for his troops in northern Jersey to hasten to his aid.

Help finally came from the latter source as the result of a bit of timely good fortune.

Instead of marching directly from Fort Washington to join the Commander-in-Chief, as he had been ordered to do in November, Charles Lee, at the head of a considerable force, hesitated, equivocated, and endeavored to cover his evasions with a series of silly explanations. It is now evident that his real purpose was to hover on the north of the British column across the Jerseys, hoping that the fortunes of war might give him an opportunity to strike a blow which would enhance his personal popularity and perhaps even secure for him the supreme command. His dream came to a sorry end on the morning of December 12, when he was caught dallying in an inn near Baskingridge and was hustled off to New York a prisoner of war.

Had Lee eventually joined Washington, he would probably have attempted at Trenton some such role as he later played at Monmouth and with more disastrous effect. Safely captured, however, his second in command, Sullivan, proceeded rapidly to Newtown, where he reported to Washington.

This reinforcement, together with several accretions of militia, built up Washington's force to 5000 and more. Having thus consolidated all his resources, he prepared to strike the first blow toward clearing the Hessians from West Jersey.

The region being infested with spies and with much disloyalty on both sides, each commander was surprisingly well informed as to the projects of his opponent. Major General Grant, writing from New Brunswick on December 24, stated: "On last Sunday Washington told his assembled generals that 'The British are weak at Trenton and Princeton.'" Such a leak, considering that Washington was especially cautious in council, is striking evidence of the espionage which existed.

Washington, however, had even more precise intelligence as to conditions among his enemies. From his headquarters in the house of William Keith, near Newtown, he and his aides received daily the reports of spies who, in the guise of loyalists, overran the Jerseys.

One of these, John Honeyman, lived near Trenton for many years after the revolution to enjoy the acclaim of his exploits at this stage of the war. He was accepted as a Tory even among the Continental troops, who repeatedly arrested him, but he always managed to escape and return to Trenton carrying with him soothing reports as to the inertness of the rebels.

It was upon the dissimulation of Honeyman and other spies that Washington planned the approaching attack. Espionage and counter espionage provided the preliminary phase of the battle of Trenton. Washington knew quite well what was taking place in West Jersey, and he was at the same time generally successful in misleading the British as to his own intentions.

"Christmas day at night, one hour before day, is the time fixed for our attempt on Trenton," Washington writes to Cadwalader.

The details of the attack were carefully planned, and the general plan was admirably suited to the situation. In fact in no battle does Washington show more consumate generalship than in this, his first real offensive. When he assumed command of the revolutionary forces a year and a half before, his military shortcomings were many, as he frankly admitted to Congress. Yet in this short time he had developed rapidly in both generalship and statesmanship. Now he was about to demonstrate to a nation already commencing to murmur doubts, his ability to plan and his ability to act when his plans went awry.

Opposite Newtown the Delawere thrusts southeast, as if intent on crossing New Jersey to the sea; then at Bordentown it suddenly changes direction toward the southwest, broadens out, and proceeds leisurely toward the Delaware capes. Situated on the inside of this wide curve, Washington was almost equidistant from the three towns held by the British—Burlington, Bordentown, and Trenton.

It is interesting to view these dispositions in the light of our later knowledge of the geological formation of New Jersey.

The lower Delaware is a wide stately river, in striking contrast to the narrow stream above Trenton. It is now supposed that the section of the Delaware below Bordentown was once part of a prehistoric sound which extended northeast to the Atlantic, cutting off southwest Jersey from the mainland. Following the geological reconstruction, the Delaware once entered this sound at Trenton. To this day the tide ebbs and flows as far north as Trenton. This fact materially influenced Washington's plan of action, as did also the width of the lower river.

When the upper reaches of this so-called Pennsauken Sound gradually filled by erosion in past ages, it became a natural avenue for coastwise land travel. It was so used by the Indians and by the Colonists, and continues as an important route in modern times. In 1776 it still marked the natural division of the Jerseys, although the political boundary, arbitrarily set up by the original proprietors, had been abolished some years earlier.

Archeologists contend that the site where Trenton stands was once an important rendezvous for prehistoric man, it being at the protected outlet of the Delaware. Its centrality gave this whole area a strong strategical value which Washington did not fail to appreciate.

With the purpose of attacking from the north, the Commander-in-Chief planned to cross the Delaware some eight miles above Trenton, where the

river is narrow. A second column was to cross below the town, with the dual mission of preventing the escape of the Hessians to the south and of holding off reinforcements from the garrison at Bordentown. Still a third column was ordered across from Bristol which, with a force moving up the Jersey side from Philadelphia, was intended to distract the attention of Von Donop from the attack on Trenton.

It was the mission of General James Ewing to move the center body of 500 Pennsylvania militiamen across below Trenton and take position at the Assanpink bridge, thus preventing the escape of Rahl's troops. But Ewing was blocked by the drifting ice, which filled the river at this point.

Likewise Colonel John Cadwalader, at Bristol, was unable to ferry his force over for the attack on the lower river town. He did, in fact, secure a foothold near Burlington, but was obliged to return to the Pennsylvania side and write mournfully to Washington, "I imagine the badness of the night must have prevented you from passing over, as you intended."

But Washington had the desperate determination which surmounts obstacles. "The town must be taken," he announced, "I am resolved to take it." After weighing all the evidence, we must conclude it was the inflexible will of Washington that carried the left to Trenton while the right and center failed.

The Commander-in-Chief concentrated his greatest strength in the wing which he himself commanded. Here were the ablest and most trustworthy of the Continental generals—Greene, Mercer, Knox, Sterling, and Sullivan.

The officers who assembled at Washington's headquarters on the afternoon of December 25 may have realized that they were on the eve of the first real campaign in American military history, although they could scarcely have visioned the far-reaching consequences which were to attend their efforts.

Just before sunset the troops were paraded in two brigades, one under Greene, the other under Sullivan. They were dressed in the most part in scant summer clothing, illy shod and poorly protected against the freezing winds which swept down from the mountains to the north. Quotations were read from recently written papers of Paine's "Crisis." The watchword was given as "Victory or Death." The order for the attack, containing Washington's famous dictum, "No man is to quit his ranks on pain of death," was published. The spirit of the moment was grim and earnest. Every effort was made, apparently, to inspire enthusiasm against the trying hours ahead.

As darkness approached, the troops moved down to the river and commenced embarking at McKonkey's Ferry, opposite the place now designated on maps of New Jersey as Washington's Crossing.

Major Wilkinson, an aide to the scheming Gates, gives in his Memoirs an interesting picture of Washington at this juncture:

> I got up with my brigade near McKonkey's Ferry about dusk, and, inquiring for the Commander-in-Chief, was directed to his quarters where I found him alone, with his whip in hand, preparing to mount his horse, which I perceived as I entered.

> When I presented the letter to him, before receiving it, he exclaimed with solemnity, "What a time is this to hand me letters!" I answered that I had been charged with it by General Gates. "By General Gates? Where is he?" "I left him this morning in Philadelphia." "What is he doing there?" "I understand him to be on his way to Congress." "On his way to Congress!" he earnestly repeated, "On his way to Congress!," then broke the seal, and I made my bow and joined General St. Clair on the bank of the river.

What a pity that this naive recital was not penned in an age of greater frankness! For we may easily recognize that Wilkinson, writing in the days of Washington's glory and attempting to expiate some of his own baser actions, deleted the raciest of the "exclamations" made on that momentous afternoon. The vagaries of Gates, the unnecessary hardships being imposed on his command, the uncertainty of the immediate project, these things were all weighing heavily on the Commander-in-Chief. His so-called "solemnity" is therefore seen to be nothing more than the quite human and understandable gravity of a much harrassed soldier who does not know if impending events are to mark him a traitorous renegade or a national hero.

The movement across the river commenced in the early mid-winter dusk.

The ferrying was done in river boats about 35 feet long, ordinarily used for hauling ore from the upper Delaware. Colonel John Glover, with his regiment of Marblehead fishermen, who maneuvered the audacious retreat across Long Island Sound, served as ferrymen.

The crossing place was above tidewater on the Delaware. Here the stream was not wide, yet it was choked with floating ice; not in such sizeable chunks as are portrayed by Leutze in his celebrated painting, still in very sturdy cakes which made the 1000-yard crossing in such small craft a very slow and difficult undertaking.

Washington went over in one of the first boats and spent the night on the river bank, impatiently watching the tedious progress of his troops. Boat after boat reached the east bank, deposited a handful of half-frozen soldiers and started wearily back for another load. More impeding than the sluggish ice and the numbing cold was the inky darkness. It was the "stentorian lungs of General Knox," we are told by Wilkinson, that did much toward urging and guiding the troops across.

It seems more than strange that during this entire movement, carried forward slowly throughout the whole night and with its attendant shouting and confusion, not a single British sentry was struck.

This ignoring of the principle of security, the first law of the professional soldier, is sometimes attributed to the carousing of Rahl and his troops in Trenton. It seems more probable however that it was rather a mistaken concept of American psychology than an overpowering appreciation of native vintages that caused the Hessians to leave the river bank unguarded.

Colonel Rahl had been duly warned to expect an attack on Christmas day. Somewhat earlier a scouting party, of which James Monroe was a member,

accidentally encountered a Hessian outpost and was beaten off. Washington, on receiving this information was filled with dismay, apprehending that the Hessians might become aroused and his whole plan be thus foiled. When the incident was reported to Rahl, however, that complacent commander accounted it as the expected attack and continued to rest in the fancied security of his own military prowess. The poor provincials, he thought, were sufficiently cowed by his very presence in Trenton.

So the movement across the Delaware continued unmolested throughout the night.

Struggling in the darkness against a high wind, the oarsmen numbed by the piercing cold, it took nine hours to ferry the 2400 men, their horses and guns. Unexpected difficulty was encountered in handling the artillery, which later, however, proved to be well worth the extra efforts expended in its movement. Washington had expected to commence the march not later than midnight, so as to reach the town an hour before dawn; it was after three o'clock on the morning of December 26 before his troops were formed in column and ready to proceed.

It so became apparent that a surprise attack under cover of darkness was impossible. Yet surprise was the element on which Washington principally based his hopes and he had timed his blow for an hour when defensive strength is at its lowest ebb. Snow and hail had commenced to fall. The Continentals, half frozen during the vigils of the night, could not complete the march on Trenton in less than five hours. One by one the carefully laid plans of Washington had failed, until there was left little hope for the success of the expedition.

This night was the darkest in the military history of the United States. Never before nor since were the fortunes of the nation so low. A single regiment could easily, during these hours, have crushed the backbone of the force that supported the incipient republic. The depth of darkness just before the faint glow of dawn.

But the very force of circumstances swept Washington forward. To retreat was now more arduous than to advance. The possibility of a surprise attack under cover of darkness was gone, yet there remained some chance of defeating the enemy in open daylight battle. At least it was the only chance left, and Washington unhesitatingly accepted it.

There were in Colonial times but two roads into Trenton from the north: River Road and Scotch Road. These roads converged in the center of the town, forming its two principal streets.

Following the road which runs west from the river, the column moved a mile and a half to Bear Tavern, thence turned south along the River Road to Birmingham.

From Birmingham, Greene's brigade, with Washington accompanying, left Sullivan and cut across country a mile to Scotch Road. Thence the two columns moved grimly forward to envelop Colonel Rahl and his unsuspecting garrison.

The sufferings of this ill-kept "army" during its movement over those desolate, wind-swept roads is difficult to appreciate in these days of physical comfort. Blood on the frozen snow marked the course of the march. Two soldiers dropped out of ranks during the night and perished from freezing. It was the personality of the Commander-in-Chief that dominated the men and held them doggedly to their objective. Falling snow wet the flintlock rifles, rendering fire discipline uncertain, but Washington refused to permit any obstacles to interrupt his determined march on Trenton.

It was eight o'clock and broad daylight before the first Hessian picket was struck. One of the sentries, firing at Washington, hit the sword in his uplifted hand but did not injure him. However, the alarm was spread and the whole town was soon aroused.

From this point the fortunes of war favored the Revolutionists, as if to reward their fixed and steady purpose of mind in precipitating the battle.

The element of surprise, it seems, aided Washington quite as much at eight o'clock as it could have had the attack been delivered earlier as was planned. The Hessian field pieces were quickly captured and, with those of the Americans. turned on the town. This artillery, emplaced so as to cover the two important streets, was able to rake the Hessians as they came tumbling out of their quarters, thus preventing any semblance of formation. Disorganized, the German was an easy prey for his foe.

After the first fifteen minutes of action, the outcome of the engagement was never in doubt. The only resistance which Colonel Rahl was able to offer came after he had assembled a few of his men on the outskirts of the town and returned in fighting alignment; but by this time it was too late. The Continentals were deployed, served their field pieces as modern machine guns, and had only to fire at the advancing Hessians to complete the first decisive victory of the Revolution.

Rahl and 100 of his men were killed in action, 500 escaped across the unguarded Assanpink bridge, and nearly 1000 were captured. Of the attacking force only two were killed. Thus within an hour was the whole complexion of the war changed from despair to courageous optimism.

Washington lost no time in following up his victory. Gathering up the increased strength which became his after the fall of Trenton, he at once attacked the British line of communications across the Jerseys. It is in this type of action that Washington shows best as a military leader—rapid maneuver and unexpected dissimulation to bring about his opponent's discomfiture, rather than in great sweeping battles; in fact, with the limited resources at his disposal Washington was never able to try his fortunes in a battle of first magnitude. At Princeton he brilliantly outwitted Cornwallis with an inferior force, and by threatening New Brunswick, where the British stores were concentrated, quickly forced a complete evacuation. Thus Trenton proved to be the key to a development which modified the whole strategy of the war.

While the direct effects of the battle of Trenton were evident enough, it appears that the indirect or negative effects were the more profound.

The British ministers who undertook to conduct the war from London were always intrigued with the idea of separating the colonies. When they finally adopted this strategy, however, their tactics were employed in the direction of the Hudson valley-Canada junction. The weakness of this scheme was strikingly evidenced later at Oriskany and Saratoga. Had the British troops retained their control of the Jerseys, it is probable that even Howe would in time have seen the needlessness of the upper Hudson campaign, since a prolonged grasp on the area held by the British on the eve of Trenton would have strangled the Revolution.

But, once ousted from the Jerseys by the aggressivness of Washington, Howe never again attempted to occupy that district. Even the operation against Philadelphia, resumed the following summer, had to be undertaken via the Chesapeake, since Washington stubbornly refused to relinquish this vital position which he had so arduously won.

Still, though they may not be deemed as strategically important as the denial of the Jerseys to the British, there is no gainsaying the direct and immediate benefits which followed the victory at Trenton.

The response within the country was instantaneous. Credit, supplies, and men became available in more liberal measure than ever before. The prestige of the professional European soldier was lowered and that of the Continental trooper correspondingly increased. The spark needed to ignite popular enthusiasm and confidence had been supplied, and the forces in the field began to receive whole-hearted public support.

The news, when it reached Europe, produced equally salutary reactions. In England, France, and Germany the struggle of the colonists commenced immediately to receive serious attention. The aid later furnished by France would never have been forthcoming had there not been some such exhibition of leadership and fighting ability to presage ultimate victory. The Tory element in England was most disconcerted to learn of such a reversal while confidently awaiting a report of the complete subjection of the colonies.

In every sense the effects of the victory at Trenton were profound. The battle was the first of the chain of events which culminated at Yorktown; yet if it had not been fought, the outcome of the war would in all probability have been far different. And the group of courageous men who achieved the victory bequeathed to the army of the United States a tradition of aggressiveness and originality in fighting which flavored the battle of St. Mihiel and which justified the Meuse-Argonne.

Armored Car Design

By Major C. C. Benson, *Cavalry*

Armored Car Design

THE business of designing fighting machines for ground troops has received far more attention from automotive engineers than from those who use the machines. Unfortunately, the engineers are not fully conversant with the needs of the troops and are prone to over-emphasize mechanical features. As a result, we find machines that are mechanically correct in which the driver cannot see and the gunner cannot shoot. Mechanical perfection is of little use if the completed machine lacks fighting ability; hence there is need in the design of fighting machines to shift the emphasis from mechanical to tactical features. To illustrate the application of this idea to a specific problem, the author presents herewith his views on the design of a heavy armored car.

Fundamentals of Design

The heavy armored car will be used by all arms for important reconnaissance work. In addition, it will be extensively employed to attack ground troops and to give protection against aircraft and against armored vehicles. It must provide mobility, fire-power, and protection for the crew. If it can have crushing power as well, so much the better, as it will have frequent need to overcome obstacles that would otherwise block its operations. To be sufficiently mobile, the machine must be capable of sustained high speed on the road and across country. Cross-country ability is especially important, because the machine will be of comparatively little use if confined to the roads. Fire power implies weapons for use against ground troops, aircraft, armored cars, and tanks. Protection for the crew, in so far as protection is possible, requires speed, armor, and suitably protected eye slits. Armor of sufficient thickness to withstand even the fire of .50-caliber machine guns will weigh more than an agile machine can carry; hence, speed enough to avoid or escape from hostile fire will be of great importance. A vehicle that embodies these characteristics will necessarily be a non-commercial product—a special machine in the same sense that attack and pursuit planes are special. No commercial machine now being built can meet the demands that will be made on a heavy armored car.

There are four main factors to consider—running gear, power plant, driver, and gunners. For the present, we shall consider only the arrangement of these elements with respect to each other. As the running gear must rest upon the ground, its position will give no trouble. The members of the crew should be together, either forward or aft of the engine compartment, because

Note.—By special arrangement with the editors, this article appears in the April issues of publications other than the Coast Artillery Journal.

they must cooperate continuously. If the engine is forward, as in some of the pioneer tanks, it may obstruct the driver's view; furthermore, its heat and fumes will nauseate the crew. The engine can do its work efficiently whether forward or aft; consequently, it should be aft, where it will not interfere with the operation of the vehicle. The central and forward positions remain available for the driver and gunners. For cross-country movements, the driver should be where he can observe closely each obstacle that is in his path; hence, the logical place for him is in the bow. This position subjects the driver to severe jolts, because the pitch of the bow is greater than amidships; but he can brace himself against expected shocks far better than can a gunner who is intent upon handling his weapons. A gunner needs the steadiest gun platform that the machine affords; therefore, he should be amidships, where the jolts and vibrations are reduced to the minimum. The most desirable arrangement of the four main elements may be represented graphically as follows:

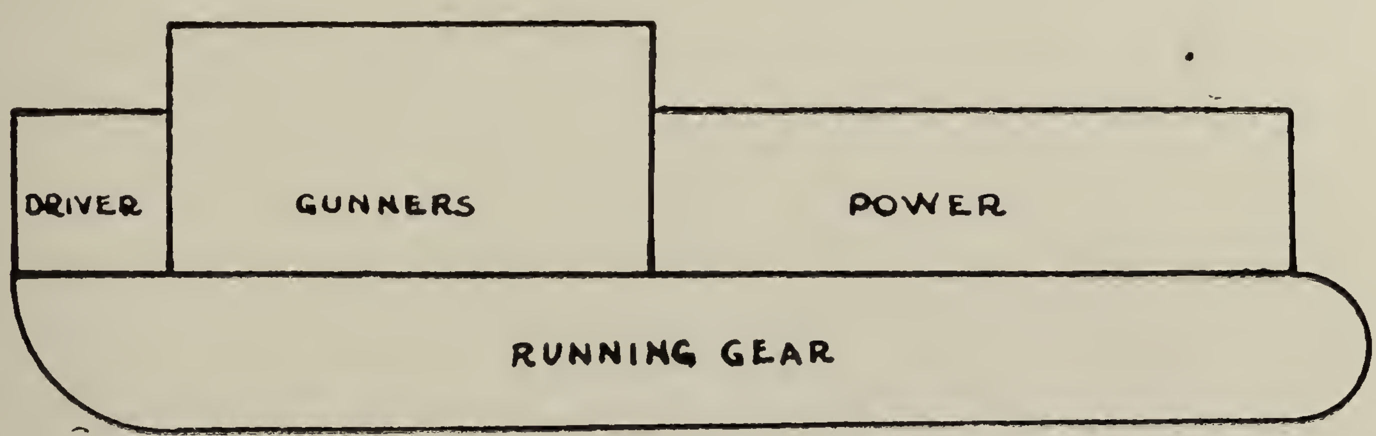


Fig. 1

Accustomed as we are to the conventional arrangement of units in pleasure vehicles, this arrangement may look queer. However, pleasure and warfare differ; we are less concerned with the appearance of an armored car than with its efficiency as a fighting machine.

With these ideas on the arrangement of the main elements, we may proceed with other features of the design. Automotive engineers will have to produce the running gear and power plant; the using service must design the hull, with suitable facilities for the crew. Part of the problem is tactical and part is technical, but responsibility for results rests upon the using service. To secure results, the using service must state definitely what it wants.

Running Gear

Various forms of running gear have been tried. They include four wheels, six wheels, eight wheels, caterpillar tracks in rear and wheels in front, full caterpillar tracks, and a combination of wheels for the road with tracks for cross-country work. Driving power is usually applied to two, four, or six wheels; or to the caterpillar tracks through rear driving sprockets. The wheeled vehicles, when equipped with oversized balloon tires, have shown far better cross-country ability than the average commercial car, and their sustained speed on the road

leaves nothing to be desired. However, even those with six-wheel drive bog down in soft ground, have insufficient traction for climbing steep slopes, and cannot surmount obstacles. Unless equipped with complicated dual controls for steering backwards or forwards, they require considerable room for turning. Caterpillar tracks in rear are better than wheels all around for cross-country travel, but not so good for speed on the road. The full caterpillar tracks give excellent service across country and enable the driver to turn his machine around in about half its own length; but the caterpillar machine cannot compete with wheeled vehicles on the road. The combination of wheels for the road and full caterpillar tracks for rough going is the most desirable that has as yet been produced. If the change from wheels to tracks, and reverse, can be made readily, this combination will meet all military needs.

For fast-moving vehicles, springs and shock absorbers are essential. Even at slow speeds, vibrations and road shocks quickly wear out machinery that is rigidly supported by an unsprung frame, because every blow is transmitted directly to the working parts. In our rigidly constructed Mark VIII tank, vibration is so great that engine bolts must be tightened after each three hours of running time. Imagine what would happen if instead of six miles an hour this machine could attain sixty! A heavy armored car will encounter good roads, poor roads, and extremely rough going where there are no roads at all, and it must rely greatly upon speed to avoid destructive fire from the enemy's weapons. In a fast fighting machine, the stability of the gunner's firing platform is another important consideration which depends largely upon the elimination of vibration and jolts. Rigid construction entails inaccurate fire except at very low speeds; and even at a snail's pace, it is difficult for a gunner to keep his sights on the target. These considerations indicate the need for the best combination of springs and shock absorbers that can be devised.

Heavy armored cars must travel under their own power; they cannot be carried on trucks, as light tanks have been in the past. It will therefore be necessary to depart from the types of running gear that have been devised for tanks. The desired type should provide wheels for road travel and full caterpillar tracks for cross-country work. The tracks must be of high grade metal to combine light weight with strength and long life; and suitable devices must be provided for changing readily from wheels to tracks or reverse. The shape of the bearing surface of the track when adjusted for operation should approximate the arc of a great circle, thus—

Fig. 2

to enable the machine to surmount obstacles and to facilitate turning. Individually sprung wheels and double-action shock absorbers should suffice to

eliminate most of the vibrations and jolts. These items cover the principal features of the running gear that is needed for a heavy armored car.

Power Plant

Lack of reserve power is a serious fault in any military vehicle. In commercial use, vehicles usually operate singly rather than in groups; each driver can take full advantage of conditions which favor his progress, and can avoid placing undue strain on his motor. In the military service, group operation and control is necessarily the rule. Even on good roads, drivers must often halt on steep grades and yet be prepared to maintain their proper places when the column moves on. While the column is moving, some machines will be going down hill while others are struggling up. Excessive extension of the unit or considerable reduction in speed will result, unless each machine has enough reserve power to meet unusual demands. In addition, military vehicles frequently have to operate on roads that commercial machines would avoid and in areas where there are no roads whatever. In combat, an under-powered machine forces the driver to shift gears for minor obstacles, and thus increases greatly the time allowed for hostile gunners to register a destructive hit. The fighting machine must have plenty of reserve power to enable it to survive.

The maintenance and repair work on military vehicles must often be done in the open. Wind, sand, rain, mud, snow, sleet, and cold impose far different conditions than are usually found in the steam-heated commercial garage. And when conditions are worst, tactical demands are often most pressing. The men available to do the necessary work will not be expert mechanics. There is, therefore, an especial need in the military service for an engine that is rugged in construction and extremely simple in design.

Invention and development are advancing so rapidly in the automotive industry that the sensation of today may be a back number tomorrow. Diesel engines, steam engines, and gasoline engines—some air-cooled and some water-cooled—present a bewildering array. Among the many excellent motors that our manufacturers produce, only those built for aircraft or for marine use have sufficient power to operate a heavy armored car. The aircraft motors will run efficiently whether top-side up or not, a very desirable feature, but none of them are designed to withstand the shocks of rough going across country. The marine motors are simpler and more rugged, but their water jackets require an unlimited supply of cool water to keep the engine at an efficient operating temperature. An armored car must carry its own water supply, and cargo space is extremely limited. An air-cooled motor of the type used in the Vickers medium tank (British) would afford distinct advantages, especially in freezing weather, but there are no high-powered American engines of this type except in airplanes. Obviously, the purpose for which a motor is intended governs its

design. We are forced to the conclusion that the right motor for a heavy armored car has not yet been built.

Rather than wait until a proper motor is designed and put into production, we may proceed with an admittedly inferior substitute. Capable automotive engineers can produce the new engine long before the Army is ready to use it. Their problem is merely to add one more engine to the hundreds they have already designed; ours is to learn how to use this new weapon tactically, and how to defend ourselves against it. It is time for us to start on our share of the business with such means as are at hand. The Army has in storage some thousands of Liberty motors which can make shift to meet our needs temporarily. They have power (338 B. H. P. at 1400 r. p. m.), and are compact; at comparatively slight expense many of their original faults can be eliminated by rebuilding. Experiments with air-cooled Liberties, already started by the Air Corps, would provide designers with valuable data. The use of the Liberty motor, air-cooled or "as is," would involve excessive maintenance and repair work, but at least we would have something to use at once for tactical instruction.

For the benefit of those who are qualified to design an engine for use in our heavy armored cars, we may briefly summarize our needs as follows: simplicity, power (about 350 B. H. P. at 1500 r. p. m.), dependability, compactness, rugged construction, accessibility, and again simplicity.

The Hull

Having thus disposed of the parts that will concern automotive engineers, we must now tackle our own share of the design. The first step will be to determine the shape and size of the hull. It must provide excellent observation, all-around fire, low superstructure and low center of gravity, balance, suitable clearance, and room for the power plant, equipment, and crew. These somewhat conflicting requirements will be troublesome, yet there are certain features which can be settled at once. The bottom of the hull will be flat, with bow and stern rounded to avoid scoop-shovel action when pulling out of depressions; the driver will be in front, and the engine compartment in rear. Experience gained in the construction of tanks provides enough data for the design of these parts. Resort to the drawing board gives the following results for progress thus far.

It is probable that with a power plant designed for use in a heavy armored car, the size of the engine compartment can be reduced, but for the present the requirements of the Liberty motor will govern. Experiments have shown that the space allowed above is sufficient. The space allowed for the driver is purposely made liberal, to accommodate the facilities with which he must be provided. The main point to note is that the design provides the driver with excellent observation to the front and flanks.

The midsection of the hull must accommodate the remainder of the crew. As the driver will have his hands full, there must be at least one gunner to use the weapons. A third man in the crew, to handle signal communications, will double its efficiency; and a fourth would be desirable. If the size of the hull is to keep within reasonable limits, so that the machine will be readily maneuverable, it will be well to draw the line at four men.

To give this crew the maximum combat value, there must be communications equipment, and weapons. Extensive experiments will be necessary to determine what should be included in the signal equipment. Radio telephone and telegraph, panels, semaphore flags, pigeons, heliograph, and pyrotechnics will all have to be tested for armored-car use. The necessary space for the selected equipment must be provided, for signal equipment in an armored car is just as important as armament. As to weapons, there should be caliber .30 machine

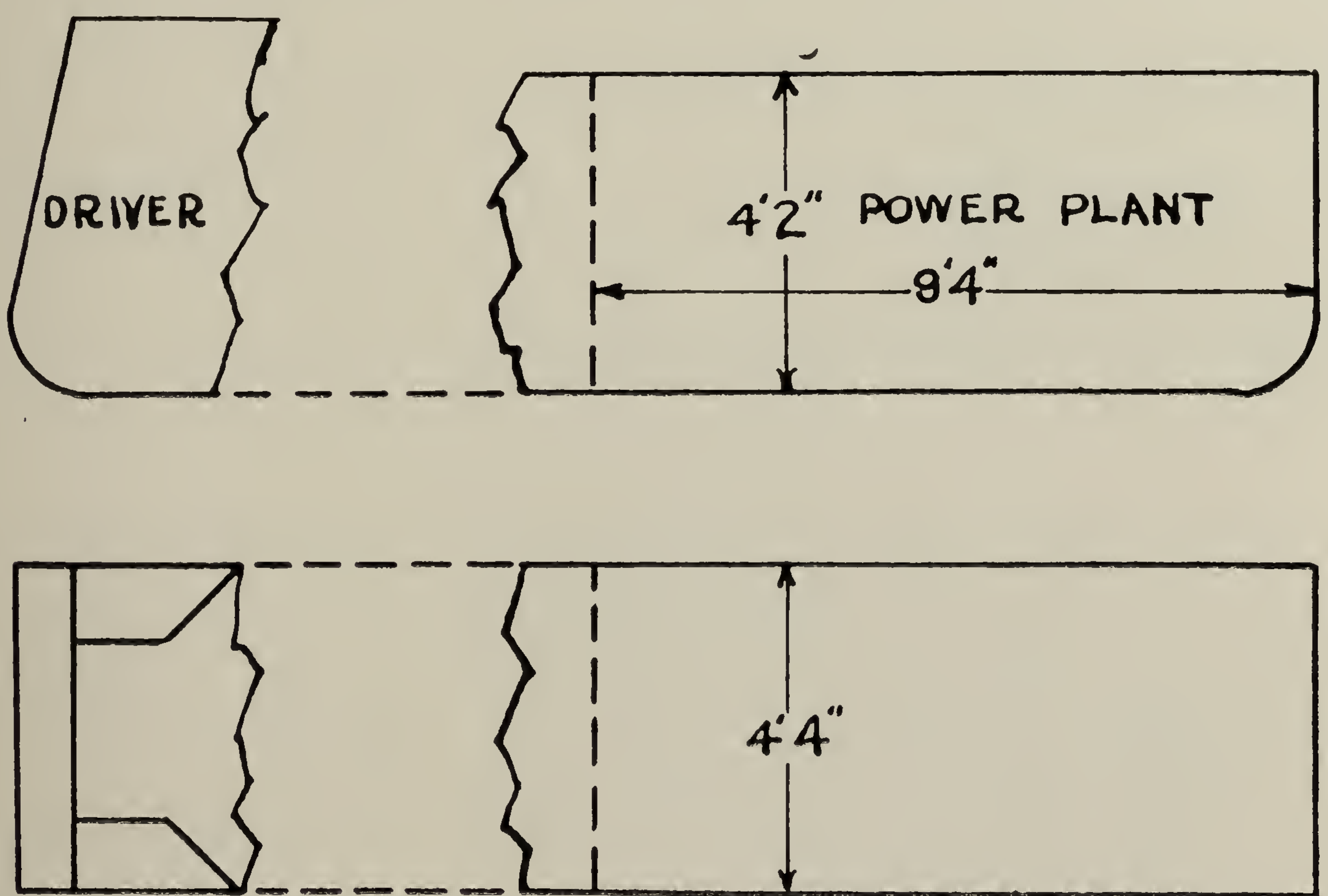


Fig. 3

guns for use against personnel; a caliber .50 machine gun for antiaircraft fire; and a three-pounder cannon to deal with hostile armored cars and tanks.

Much might be written about other items of equipment and detailed facilities that should be provided for the driver and for other members of the crew. Some of the items that need attention are: Ammunition racks, an instrument board with luminous dials, compass, periscopes, gas masks, tools, spare parts, responsive controls, interior lights, head lights, tail light, flashlights, towing cables and brackets, individual lockers, fire extinguishers, fire-proof bulkhead for engine compartment, camouflage materials, splash guards, demolition equipment, photographic equipment, food and water containers. These and related

matters are properly the subject for thorough investigations, which should be made with full-sized wooden models before the first steel hull is built. Until these investigations have been made, we cannot draw up a complete design. It is possible, however, to prepare a lay-out that will accommodate at least the major items. Without more ado, we submit the following design for the hull.

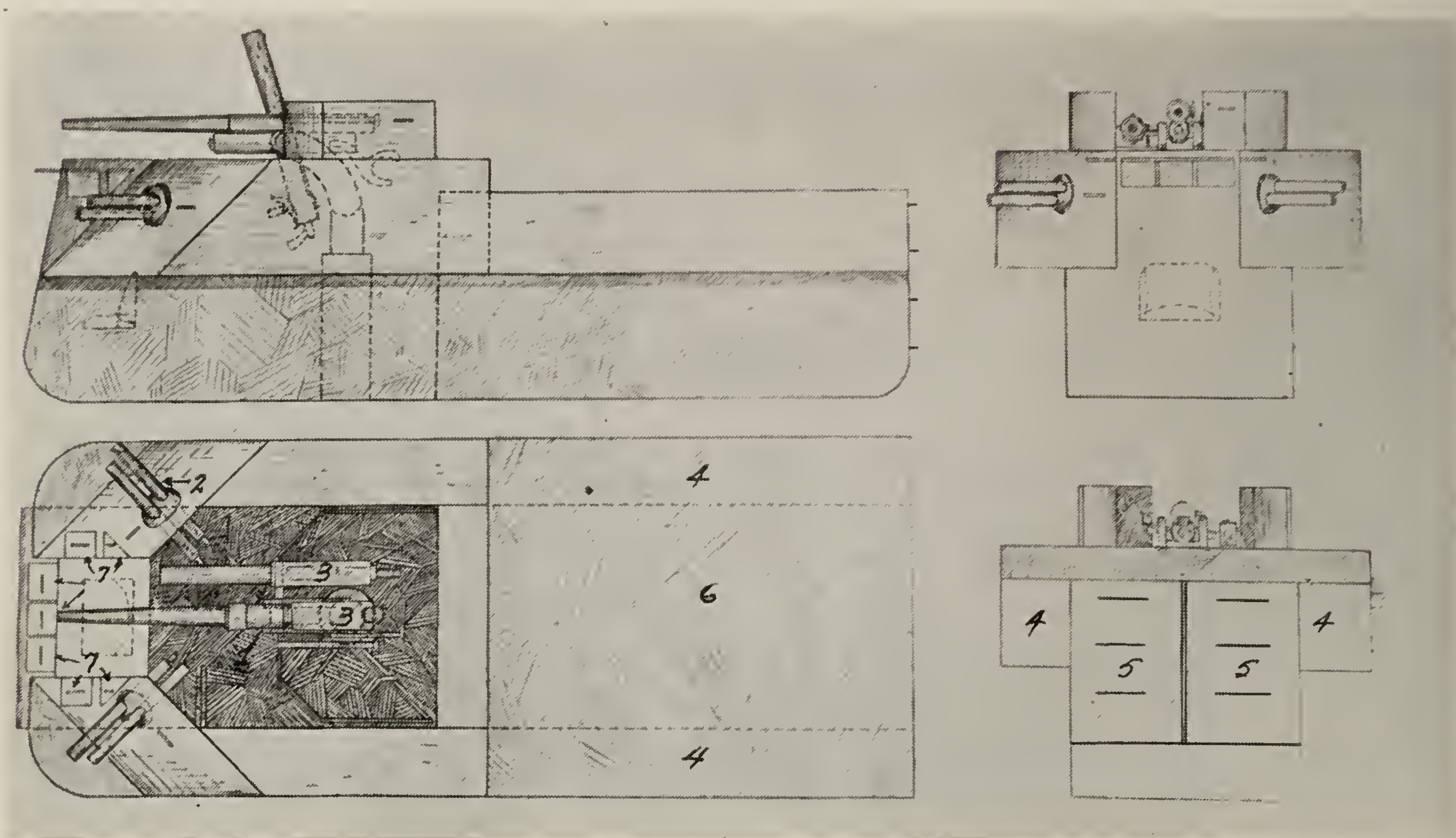


FIG. 4

The following numbers refer to corresponding numbers on the sketches.

1. Fighting compartment (heavy line), extends out over running gear, normally open at the top, roof in suitable sections carried on top of engine compartment. Permanent roof over driver's seat. Front plates slope forward at an angle of 45 degrees. Entrance and exit over the top.

2. Caliber .30 machine guns, air-cooled, two in each mount. Horizontal traverse about 130 degrees. Mounts placed to allow each gunner as much room as possible. Primarily for fire to the front and flanks against personnel; can also furnish some antiaircraft fire.

3. Three-pounder cannon on pedestal mount, semi-automatic, high velocity, all-around traverse. Small shield on gun to protect gunner from machine-gun fire. Caliber .50 machine gun, air-cooled, for antiaircraft fire, on same mount, to right or left of cannon.

4. Armored gasoline tanks, extend out over running gear, capacity 100 gallons each. Beneath the armor are inner tanks, self-sealing if punctured.

5. Water-tight hinged doors which give access to power plant. There are similar doors in the fireproof bulkhead which separates the fighting compartment for the engine room. Door handles serve also as steps of ladder to roof. Tool racks on inner surface of each door.

6. Flat roof of engine compartment provides a place for carrying caterpillar tracks when the machine is operating on wheels.

7. Observation ports, backed with thick shatter-proof glass, and protected outside by steel doors with suitable eye slits or holes for use when under fire.

Assembly

There remains the important matter of fitting the running gear to this hull. As previously mentioned, the combination of wheels for the road with full caterpillar tracks for cross-country work, is most desirable for our purpose. Running gear of this type, invented by Mr. Walter Christie, is now undergoing tests on a new experimental machine. The performance of this gear to date has been fully satisfactory, but whether it will stand up under the full load of the completed machine remains to be seen. The total weight of the machine, fully equipped and armored against .30-caliber bullets, will be about twelve tons. To travel at sixty miles an hour on the road and about thirty across country, this machine must have running gear of exceptional quality. The tracks particularly will have to be strong enough to withstand terrific strains, and yet light enough to permit easy removal and handling. The following sketch shows running gear of the Christie type combined with the hull described above. Note that the caterpillar tracks extend beyond the hull, so that neither bow nor stern can dig into an obstacle or steep bank.

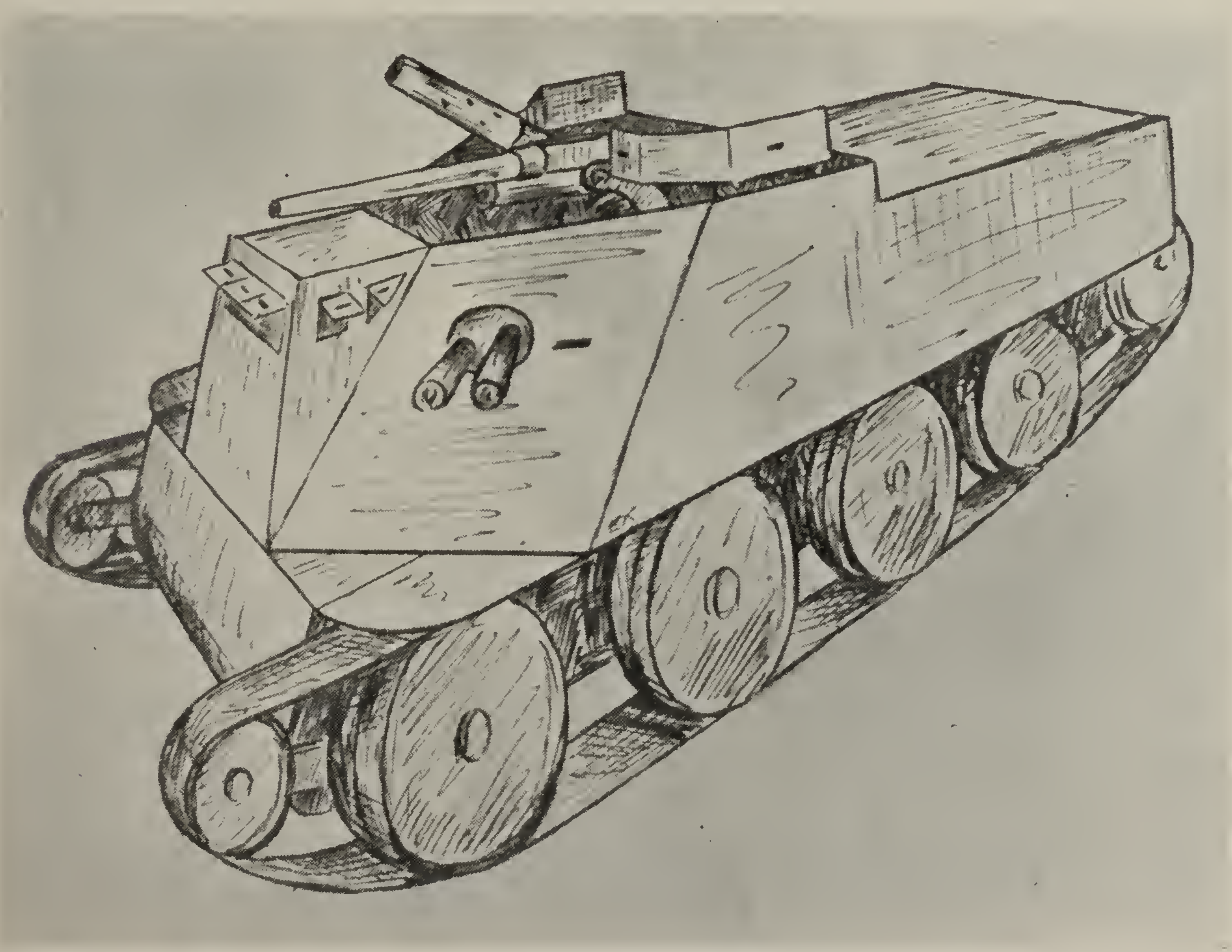


Fig. 5

In producing a new model automobile, manufactures consult not only their designers but also the production, service, and sales departments. A similar

system might well be applied to new fighting machines for the Army, but unfortunately we have no arm or service which combines these viewpoints under the control of one responsible head. Lacking such an agency, we must rely upon the cooperation of interested officers throughout the Army to point out mistakes and suggest improvements. Costly mistakes and needless delays will occur in building heavy armored cars unless we develop sound ideas on the fundamentals of design. In addition, there must be careful consideration of matters that affect production and service. The ultimate consumer—the using service—should get what it needs for tactical use in combat. If the using service neglects its share of the problem, it must be satisfied with what others produce.

The system of education at West Point, I have opportunities for observing . . . and I believe in it. Thanks to the discipline, to the small divisions, where every pupil studies every day, and the liberal course of study, every graduate of West Point and of Annapolis is an educated man. I have not met one exception.—Professor William Lyon Phelps, of Yale.

PROFESSIONAL NOTES

Coat of Arms for 197th Coast Artillery (A. A.)

Shield: Azure, in base a lion passant guardant *or,* and in fess a lozenge and a fleur-de-lis *argent;* on a chief *gules* fimbriated of the second a winged projectile, wings inverted, of the last.

Crest: That for the Regiments of the New Hampshire National Guard. On a wreath of the colors (*or* and *azure*) two pins branches saltirewise proper crossed behind a bundle of five arrows palewise *argent,* bound together by a ribbon *gules,* the ends entwining the branches.

Motto: A Bas l'Avion (Down with the Plane).

The 197th Coast Artillery (A.A.), New Hampshire National Guard, was formed in 1922 from existing companies to perpetuate certain units of the 1st Infantry, New Hampshire National Guard, and also certain units of the former Coast Artillery Corps, New Hampshire N. G. Federal recognition was given the regiment on June 30, 1922. The present regimental organization is as given below:

Unit	*Originally Organized*	*Federal Recognition*
Bn Hq & Combat Train	1922	June 9, 1922
Hq Battery	1865	June 29, 1922
Battery A	1891	Dec. 22, 1921
Battery B	1780 (about)	Mar. 17, 1922
Battery C	1861	Mar. 30, 1922
Battery D	1861	Feb. 16, 1922
2nd Bn Hq & Combat Train	1898	May 16, 1922
Battery E	1879	Dec. 6, 1921
Battery F	1878	June 30, 1922
Battery G	1878	Jan. 27, 1922
Battery H	1878	May 15, 1922
Medical Detachment	1922	Aug. 7, 1923
Service Battery	1887	June 29, 1922

The oldest unit in the regiment is Battery B, claimed to have been organized some time prior to 1780 as the 1st Company, Light Infantry, 2nd Regiment, 2nd Brigade, 2nd Division, New Hampshire Militia. This company was in federal service during the War of 1812 from May 25 to July 2, 1814, under command of Captain Pierce, and was attached to "Long's command, New Hampshire Militia," at Portsmouth harbor. In December, 1823, this company was reorganized as the Strafford Guards of Dover, N. H.; the Strafford Guards were a part of the escort for the Marquis de Lafayette on the occasions of his visits to the towns mentioned. In 1825, on September 6, this company participated in the memorial ceremonies for Lafayette. On January 8, 1863, the company gave military burial to a soldier of the 11th N. H. Regiment, who had been killed at Fredericksburg. Mustered into U. S. service on May 5, 1864, for sixty days, and served at Fort Constitution, being mustered out of the U. S. service on July 25, 1864. The Strafford Guards were also known during the Civil War as Littlefield's Company, N. H. Militia. On Nov. 15, 1864, participated in a celebration of the re-election of President Lincoln. On April 10, 1865, participated in celebration of the surrender of General Lee. On May 5, 1865, ordered to participate in the funeral ceremonies for president Lincoln. No record of service in the Revolutionary War or Mexican War can be found.

The following table showing units of the 1st Infantry and Coast Artillery Corps, N. H. N.G., the corresponding units in the present 197th Coast Artillery (A.A.), N. H. N. G., and the Civil War units of the present regiment is tabulated for convenience in reference:

(1917) Units of 1st Inf., N. H. N. G.	*Present Designation in 197th C. A.*	*Originally Organized As*	*Date Organized*	*Civil War Designation*
Co. C	Hqrs. Btry.	State Capitol Gds.	Oct. 31, 1865	
Co. D.	Ser. Btry.	Co. C, 2d Rgt., N. H. Mil.	Apr. 30, 1887	
Co. E	Btry. A	Co. E, 3d Rgt., N. H. Mil.	Apr. 14, 1891	
Co. M	Hq. 2d Bn.	Co. M, 3d Rgt., N. H. Mil.	Jan. 28, 1898	
Co. I	Btry. E	Co. I, 2d Rgt., N. H. Mil.	Apr. 3, 1879	
Co. L	Btry. F	Co. G, 3d Rgt., N. H. Mil.	Apr. 24, 1878	
Co. H	Btry. G	Co. H, 2d Rgt., N. H. Mil.	Apr. 29, 1878	
M. G. Co.	Btry. H	Co. H, 3d Rgt., N. H. Mil.	Apr. 25, 1878	
Units of former C. A. C., N.H. N.G.				
4th Co.	Btry B.	1st Co., L. I., N. H. Mil.	About 1780	Strafford Guards or Littlefield's Co.
2nd Co.	Btry. C	Laconia Vols.	Apr. 15, 1861	Co. F, 2d N. H. Vol. Inf.
1st Co.	Btry. D	Goodwin Guards	May 30, 1861	Co. K, 2d N. H. Vol. Inf.

It will thus be seen that three of the present units of the 197th C. A. (A. A.), N. H. N. G., were in U. S. service in the Civil War; two companies (F and K) in the 2d N. H. Volunteer Infantry. The latter regiment was mustered into the U. S. service on June 10, 1861, at Portsmouth, N. H., and was finally mustered out of the U. S. service at City Point, Virginia, on December 19, 1865, having participated in the following battles:

Bull Run, Va.	July 21, 1861.
Yorktown, Va.	April 4 to May 4, 1862.
Williamsburg, Va.	May 5, 1862.
Fair Oaks, Va.	May 31 to June 1, 1862.
Savage Station, Va.	June 29, 1862.
Malvern Hill, Va.	July 1, 1862.
Groveton and Bull Run, Va.	Aug. 29 and 30, 1862.
Gettysburg, Pa.	July 1 to 3, 1863.
Swift Creek, Va.	May 8, 1864.
Drury's Bluff, Va.	May 16, 1864.
Cold Harbor, Va.	June 1 to 12, 1864.
Petersburg, Va.	June 16 to Aug. 31, 1864.
Fair Oaks, Va.	Oct. 28, 1864.
Appomattox Courthouse, Va.	April 9, 1863.

(Authority: Old Records Div., AGO, WD—Volunteer Battle Register, 1861-65).

Ten of the units in the present regiment were mustered into the service of the United States for the Spanish-American War, as follows:

Present Designation in 197th C. A. (A. A.), N. H. N. G.	*Designation in Spanish-American War*
Headquarters Battery	Co. C, 1st N. H. Volunteers
Service Battery	Co. I, 1st N. H. Volunteers
Battery A	Co. E, 1st N. H. Volunteers
Battery B	Co. F, 1st N. H. Volunteers
Battery C	Co. K, 1st N. H. Volunteers
Battery D	Co. A, 1st N. H. Volunteers
Hqs. 2d Bn. & Combat Train	Co. M, 1st N. H. Volunteers
Battery F	Co. G, 1st N. H. Volunteers
Battery G	Co. L, 1st N. H. Volunteers
Battery H	Co. H, 1st N. H. Volunteers

The 1st New Hampshire Volunteers was mustered into U. S. service at Concord, N. H., on May 8 to 14, 1898, and was mustered out of the Federal service at Concord, N. H., on Oct. 31, 1898. It had no foreign service.

Eight units of the present regiment were in service on the Mexican Border at Laredo, Texas, as follows:

Present Designation in 197th C. A. (A. A.), N. H. N. G.	*Designation While in U. S. Service on Mexican Border*
Headquarters Battery	Co. C, 1st Regt. Inf. N. H. N. G.
Service Battery	Co. D, 1st Regt. Inf. N. H. N. G.
Battery A	Co. E, 1st Regt. Inf. N. H. N. G.
2d Bn. Hqs. & Combat Train	Co. M, 1st Regt. Inf. N. H. N. G.
Battery F	Co. L, 1st Regt. Inf. N. H. N. G.
Battery G	Co. H, 1st Regt. Inf. N. H. N. G.
Battery H	Machine Gun Co. Inf. N. H. N. G.
Battery E	Co. I, 1st Regt. Inf. N. H. N. G.

In the World War the entire 1st Regiment, N. H. N. G., was mustered into U. S. service on July 25, 1917, at the home stations of the various companies, and the regiment was mobilized at Concord, N. H., on July 27, 1917. In August, 1917, 1630 officers and men of the regiment were transferred to the 103d Infantry, 26th Division. The balance of the regiment was redesignated the 1st Army Headquarters Regiment on Feb. 11, 1918, per G. O. No. 11, Hq. 51st Depot Brigade, 26th Division, dated Nov. 5, 1917. The 1st Army Headquarters regiment arrived in France on April 2, 1918, and served in the S .O. S. until the Armistice. The regiment is not entitled to battle credit but is entitled to credit for service in France from April 2, 1918, to Nov. 11, 1918.

The three companies of the former Coast Artillery Corps, New Hampshire National Guard, now incorporated in the 197th C. A. (A. A.), N. H. N. G., show the following history in the World War:

Present Designation in 197th C. A. (A. A.), N. H. N. G.	
Battery B	Mustered into U. S. service July 25, 1917, as 4th Co., C. A. C.; redesignated the 8th Co., C. A. C., Ft. Constitution (Portsmouth, N. H.); demobilized Dec. 20, 1918. Reorganized 1921 as Battery B, 197th C. A. (A. A.), N. H. N. G.
Battery C	Mustered into U. S. service July 25, 1917, as 2nd Co., C. A. C., N. H. N. G.; redesignated the 6th Co., C. A. C., Ft. Constitution (Portsmouth, N. H.); demobilized Dec. 18, 1918. Reorganized 1921 as Battery C, 197th C. A. (A. A.), N. H. N. G.
Battery D	Mustered into U. S. service April 13, 1917, as 1st Co., C. A. C., N. H. N. G.; redesignated 9th Co., C. A. C., Ft. Constitution (Portsmouth, N. H.); demobilized Dec. 19, 1918. Reorganized 1921 as Battery A, 197th C. A. (A. A.),

N. H. N. G. Redesignated Battery D, 197th C. A. (A. A.), N. H. N. G., by G. O. No. 5, W. D., Feb. 12, 1923.

All service was at Ft. Constitution, Portsmouth, N. H., and therefore no battle credits are involved.

Under authority of G. O. No. 16, W. D., 1921, as amended, the 197th C. A. (A. A.) is entitled to the following battle honors:

Civil War

Bull Run	Virginia 1864
Peninsula	Cold Harbor
Manassas	Petersburg
Gettysburg	Appomattox

World War

(Streamer without inscription)

The shield is blue to indicate the longer service of the unit as Infantry. The gold lion passant guardant is for the service in the War of 1812; the white lozenge—the corps badge for the 2nd Division, 3rd Corps, during the Civil War—represents Civil War Service; and the fleur-de-lis indicates service during the World War. The chief is red for Artillery and the winged projectile indicates that it is an antiaircraft unit.

Coast Artillery Target Practice

The Chief of Coast Artillery, Major General Andrew Hero, Jr., has completed a study of the results of all target practices in the Coast Artillery held during the year 1928 and has submitted a confidential memorandum to the War Department indicating the results obtained. In general, the target practice year 1928 has been highly satisfactory. The excellent results that have been obtained are partly due to the inauguration, in 1926, of a system of scoring all battery organizations, whereby all are on a competitive basis.

Prior to the commencement of artillery firings for the year 1928, upon the recommendation of the Chief of Coast Artillery, the War Department prescribed minimum ranges for all seacoast and antiaircraft firing. Notwithstanding the increased range at which target practice was held the comparison with the similar results for 1927 show marked progress as:

The average range of 87% of the practices was greater.

Increased accuracy was obtained in 58% of the practices.

The rate of fire was increased in 98% of the practices.

The hits per gun per minute were increased 79%.

Some of the outstanding records for the year follow: In one practice with the 155-mm. guns the average time to fire one round was 11 seconds at a range of approximately 15.000 yards and 27% of hits was obtained. In another practice with this type of armament at a range of over 5500 yards conducted at night 54% of hits were made. In a practice with the 14-inch guns 58% of hits were obtained at a range of approximately 17,000 yards wherein the battery secured over 1.5 hits per battery per minute. A 3-inch gun battery made 68% of hits at a range of over 5000 yards resulting in 9 hits per gun per minute.

For the antiaircraft artillery marked improvement over the previous year's shooting was obtained. This is especially true with machine guns. In one practice at a range of approximately 900 yards (2700 feet) and during 9 separate flights by a tow target airplane approximately 13% of hits were secured. The rate of fire obtained during this practice indicates that 90 hits per gun per minute were obtained. With the 3-inch antiaircraft guns there was one practice where 45 hits were made at a range of over 15,000 feet (5000 yards).

There were five regiments in which all regular target practices were classified as "excellent" (the highest classification for Coast Artillery units). These were:

92d Coast Artillery (HD), Philippine Islands.
2d Coast Artillery (HD), Canal Zone.
15th Coast Artillery (HD), Hawaii.
41st Coast Artillery (RY), Hawaii.
1st Coast Artillery (HD), Canal Zone.

The 92d Coast Artillery, manning 155-mm. guns, stationed in the Philippine Islands has been selected as the leading regiment for the year 1928. Forty-nine per cent of all organizations firing were classified as "excellent" by the War Department and are entitled to wear the badge of "E" on the sleeve denoting excellence in target practice.

More About the Probable Error

By Captain Harold R. Jackson, C. A. C.

Although the subject of the probable error has been discussed many times, there appears still to be room for debate as to how to determine the value of the probable error of a battery for use in adjustment of fire; also, opinions differ as to the fairest method of using the D. A. P. E. in computing the score by which a battery is to be rated.

In two articles which appeared in the Coast Artillery Journal during the past year, considerable space was devoted to showing the effect on adjustment and effectiveness of fire due to the assumption of a probable error either one half or twice the correct value. In both articles it was apparently assumed that the proper probable error for use in adjustment of fire would be the D. A. P. E. of the practice; and that, since the D. A. P. E. cannot be determined until a practice has been fired, the battery commander must use a probable error which may be as much as 100% wrong.

As a matter of fact, an adjustment correction should be a function, not of the D. A. P. E., but of the true probable error of the battery; and this we can determine with reasonable accuracy.

The probable error does not vary with each practice any more than it varies with each salvo or each round. It changes only when the condition of guns or carriages changes, as after a general overhaul. In general, such a change will probably be very small.

The best method of determining the probable error of a battery is by an examination of records of former practices. But how many previous practices should be considered? And, if insufficient records of past practices are available, what value should be assumed?

An answer to the first question was found by a study of the practices fired by certain G. P. F. batteries in 1926 and 1927. At first thought, it would seem that one hundred rounds would be sufficient to determine the probable error. But it was found by tabulation that the probable error developed in one hundred rounds varied from that developed in one hundred seventy-five rounds as much as 20%. It was also found that the probable errors developed by the nine batteries considered in the two years' practices varied from the firing-table probable errors by an average of only eight per cent and a maximum of twenty per cent. The conclusion was therefore made that when fewer than one hundred fifty rounds are available for the computation, the firing-table probable error should be taken as the field probable error.

The average probable errors at different ranges for a number of batteries developed in several hundred rounds were found to agree within about ten per cent with the firing-table values.

A tabulation of results follows:

Range	Firing Table P. E.	Developed P. E.	No. of Shots Considered	Regiment by Which Majority of Practices Were Fired
8000	52	57	443	55th C. A.
10,000	63	56	186	51st C. A.
15,000	97	88	278	55th C. A.

All these practices were fired with the supercharge.

It will be noticed that the 51st Coast Artillery developed a smaller probable error at 10,000 yards than the 55th developed at 8000 yards. This result is probably due to superior calibration of the batteries of the 51st. They have held calibration practices at least once since those of the 55th.

At 15,000 yards the firing-table probable error appears to be about ten per cent too large. More data at this range will be available when the results of the 1928 practices are published.

If the probable error is determined as indicated above, it will practically always be within twenty per cent of the true value, and usually within five per cent, and the effectiveness of fire will not be materially reduced because of such error.

Having decided that the D. A. P. E. has no bearing on the adjustment of fire, its use in computing the score by which a battery is rated was next considered. Although the revised method of computing the score has already been published, a discussion of the score used in 1928 will be of interest to officers who fired in that year. For this purpose the *A*, *B*, and *C* components of the 1928 score were taken up separately.

Since the fall of a limited number of shots may be very erratic, it would be difficult, if not impossible, to determine, theoretically, whether the percentage of hits, and consequently the hitting component, should be a function of the D. A. P. E. or of the true probable error. Consequently the problem was solved by a tabulation of all 1927 practices in which adjustment was attained. In this way it was found that, while no regular law was apparent, yet exceptionally large percentages of hits usually occurred when the D. A. P. E. was smaller than the firing-table probable error, and vice versa. It was concluded, therefore, that the use of the D. A. P. E. in the *A* component was justified.

Incidentally, it was found in the course of this investigation that the percentage of hits obtained averaged forty per cent higher than the expected percentage, based on either the firing-table probable error or the D. A. P. E., thus indicating an unaccountable hump in the probability curve in the vicinity of the C. I.

The results of the 1927 practices show relatively few points lost in the *B* component. Of the batteries that were penalized in this component, two-thirds had D. A. P. E.'s smaller than the firing-table probable errors. It seems illogical that batteries that develop small probable errors should be penalized for poor calibration, yet such was the case. The use of the firing-table probable error instead of the D. A. P. E. would have remedied, in part, what seems to have been an injustice.

"In part," because it was also found that the factors by which the probable errors were multiplied appear also to be erroneous. By a tabulation of the fall of one thousand fictitious rounds fired with the hit bag, it was found that the average dispersion of four-round volleys was 3.1 probable errors, of three-round volleys was 2.6 probable errors, and of two-round volleys was 1.8 probable errors. Hence, with perfect calibration and normal dispersion, the average score for batteries firing four-gun volleys should be eight out of ten. So, while calibration is a thing to be worked for, it is not believed that the 1928 *B* component was a fair measure of it.

For the *C* component, nothing but a theoretical discussion could be evolved. As used in 1928, the adjustment component varied directly as the D. A. P. E. Should it? Suppose that a battery develops a relatively small probable error in a practice. Such a D. A. P. E. would indicate that the shots of the practice were distributed more closely

about the center of impact than the average. It is easily conceivable that an abnormally close grouping of the shots on which adjustment corrections are based might seriously hamper adjustment by the bracketing method. In such a case, the battery would be penalized twice because of no fault nor error: once by having poor adjustment, and once by the use of the small D. A. P. E. in the adjustment component.

From these considerations, it seems that the size of the D. A. P. E. bears little relation to the adjustment, and that there is no cause to fear that adjustment will be prevented because of an erroneous assumed probable error. Moreover, none of the adverse criticisms made above on the 1928 score are applicable to the new score.

Marshall Foch's Story of the Armistice

An Interview by STEPHANE LAUZANNE

Translated from *Candide*, and published in *The Living Age*

EXTRACT

* * * * *

As I looked at them I said to myself, 'Behold the German Empire, beaten and asking for peace. *Eh bien!* Since it is coming to me, I shall treat it as it deserves. I shall be firm and cold, but without bitterness or brutality.'

* * * * *

'They came into my car,' he said, 'looking stiff and pale. One of them, whom I assumed to be Matthias Erzberger, mumbled a request that I make the necessary introductions. But I was content merely to reply: "Have you any papers, gentlemen? If so, let us examine their validity." Whereupon they showed me papers signed by Prince Max of Baden, which I regarded as satisfactory. Then I turned to Erzberger and asked: "What do you want?" He replied, still mumbling: "We have come to receive the proposals of the Allies for an armistice." I stopped him abruptly. It was the only time that I was cutting. "I have no proposals to make." The four Germans looked at each other. "Well," said one of them, Count Oberdorff, "*Monsieur le Maréchal*, tell us how you want us to put it. Our delegation is ready to ask you for the conditions of an armistice." But I insisted: "Are you formally asking for an armistice?" "Yes." "Then please sit down and I will read you the conditions of the Allies." '

* * * * *

'I began to read the conditions of the Armistice slowly,' Marshal Foch went on. 'After each paragraph I stopped to allow the interpreter to translate. Then I watched the men to whom I was talking and as the translation proceeded I studied the impression it was making in their faces. Little by little I saw disturbance spread over their countenances. Winterfeldt especially was very pale. I believe he even wept. When the reading was finished, I said simply: "Gentlemen, I will leave you the text. You have seventy-two hours to reply. At the end of that time you may let me have your observations in detail." Erzberger, however, became pathetic. "In heaven's name, *Monsieur le Maréchal*," he said, "do not wait seventy-two hours. Stop the fighting today. Our armies are a prey to anarchy. We are threatened by Bolshevism. Bolshevism may sweep all Germany and menace France itself." "I do not know in what condition your army may be," I answered. "I know only in what situation my own armies find themselves. Not only is it impossible for me to stop the offensive, but I am giving an order for redoubling the vigor of the pursuit." Winterfeldt intervened in his turn: "But, *Monsieur le Maréchal,* it is necessary for our staffs to meet and discuss in detail the carrying out of the Armistice. How can they do this if hostilities continue? I beg you to halt hostilities for technical reasons."

'Again I replied, "Technical discussions can take place just as well seventy-two hours from now. Until then, the offensive will continue." That was the last of it. The four plenipotentiaries rose and departed.'

During the two days that followed, November 9th and 10th, Marshal Foch slept very little. He had no doubt that the German plenipotentiaries would accept his conditions; but wireless messages intercepted at the Eiffel Tower brought news that revolution had broken out in Berlin. Then Foch began to ask himself this disturbing question: 'What government did those men in the forest represent?' Nevertheless, on the evening of the tenth he regarded it as necessary to remind the Germans, through General Weygand, that at daybreak the next day the seventy-two hours would be over. Then they must sign or go.

Scarcely had Weygand completed his mission when Captain de Mierry, one of Foch's staff officers, was called to the telephone and a wireless message just received at the Eiffel Tower was read:—

> THE GERMAN GOVERNMENT to the GERMAN PLENIPOTENTIARIES at the ALLIED HIGH COMMAND. (6:30 p. m.)
>
> The German Government accepts conditions of the Armistice which were offered to it on November 8th.
>
> THE CHANCELLOR OF THE EMPIRE,
> 3084

* * * * *

'Then,' said Foch, 'I slept no more. A little after two o'clock in the morning, the German plenipotentiairies came back to my car and began a final discussion. They demanded that, in view of the troubled conditions of all Germany, the army should be allowed to keep a larger number of machine guns to maintain order. I therefore allowed them five thousand machine guns and a hundred motor trucks. That was all. At exactly 5:15 in the morning they signed the Armistice, writing their names in big, angry letters. . . .'

* * * * *

Ships Instead of Picture Cards

We have heard that the cry of "Wolf!" loses its force if too often and falsely sounded, and it is equally true of the cry of "Lamb!" when over-used. The long cruiser debate and the vote that followed it showed conclusively, not only that the prophets of peace have lost their persuasion, but that the fondly indulged gesture of pretending to rebuild the American navy to scare foreign powers into disarmament conferences at last has been revealed in all its emptiness and futility.

The senate and the country could no longer back away from the facts. The belief that the good faith of this government was played upon at the Washington arms limitations conference has been growing since the failure of the Geneva naval parley. It was freely expressed in the senate debate, where the strongest reflections were thrown on the subsequent naval policy of Britain in contrast to the almost fatuous course of this government in sacrificing its own navy and indulging hopes to the point of credulity in the ever dimming prospects of disarmament by international agreement. The senate's present action is the result of the awakening.

The senate has said, in effect, as did the house in its passage of the cruiser bill with a time limit clause, that if authorization of the ships is a good card to play in the armament limitations game, construction of them is a better. The action of congress means we are to have ships instead of picture cards.—*The Kansas City Star.*

Foreign Periodicals

BALLISTIC ATLAS. In this article, by Giovanvi Conti, Captain of Artillery, published in the *Rivista di Artiglieria e Genio* for October, 1928, the author, after indicating the difficulties encountered in determining with any degree of accuracy the elements of a

trajectory by the present methods, shows how it is possible to deduce from a single trajectory the elements of an infinite number of others and proposes to construct once for all, by rigorous methods, a certain number of trajectories, assembled in tables (Ballistic Atlas) from which it will be easy to find the elements of any other trajectory.—F. E. H.

An Army of British School Boys. The *Militär-Wochenblatt* announces: "A number of British School boys put in during the past Summer for ten days a part of their vacation in military uniforms and under military restraint and military discipline, camping out with troops. The fact that all who were selected for these camps regarded it as a special distinction is evidence of the favorable acceptance of this voluntary participation in the defensive system of the country. The young boys obtained from their experience in the camps a perception of the value that their experience would have in case of war. They participated in tactical exercises with cavalry, flyers, and mechanized troops or looked on these exercises as spectators. The effect of this training was evident when it was seen that during the entire period of the encampment they cleaned their buttons and shoes made their beds and washed their dishes and kept their rifles clean."—G. R.

Exclusion and Elimination of Unsuitable Pscycopathic Men From the Army. The October 18, 1928, issue of the *Militär-Wochenblatt* publishes an article written by Surgeon General Dr. Herold, German Army, retired, on the above subject, in which he says: "During my term of service in the army I was frequently called upon by military courts to give medical judgment in regard to the responsibility of men who had been guilty of serious offenses against military discipline and order. They were mostly persons whose intelligence was not in question but who exhibited defects in ethical and moral respects—cases of so-called pscychopathic personalities. They were men unstable, irritable, irascible, showing deficiency of endurance in the work assigned to them, with outbursts of exaltation and inclination to suicide, unsocial in civil life, and disobedient and insubordinate in the military service. Their influence in injury to troops cannot be underestimated.

"The destructive moral epidemics that can menace the security of an army are revolt and cowardice. The pscychopaths of the class above referred to are ready subjects of the destructive vagaries of communism; they display a strong tendency to cowardice, desertion in face of the enemy and from among them are recruited almost exclusively the mass of shirkers of whom, it is to be regretted, we had an abundant supply especially during the latter end of the war. In the recruiting supply methods of our old army it was practicable to exclude weak-minded men from the army by means of information and records always at hand or readily available and such men seldom succeeded in getting through and if they did were soon detected and disposed of, although men of that class are less dangerous than the psychopaths who are not deficient in intelligence."

As a remedy for these conditions, or at least to minimize their effect, Dr. Herold recommends that officers be qualified by lectures to be given by sanitary officers with information that would enable them early to detect men who show any tendency toward abnormal ethical conduct. They would bring such cases at once to the attention of competent medical officers who would then determine the status of the individual in question and pass judgment as experts. The same course would be pursued for officers having charge of examination of applicants for enlistment in the Reichswehr. It would also be necessary that medical officers be thoroughly trained in study of mental disorders. In many families of today youths are no longer brought up with religious impressions and become facile subjects of communistic doctrines openly promulgated. The material and sensual impressions are also given greater facilities for exercise of their influence than ever before and exert such influence to a larger extent on persons of unstable character and psychically deficient.

The author further holds that what he has here said about measures of discrimination in admission and exclusion of enlisted men from the army applies with even greater force to those seeking admission or who may have already been admitted to the commissioned

ranks and that the greatest possible care shall be exercised that they possess in full measure the spiritual harmony for the avocation they seek. Intelligence, which will undoubtedly not come into question in their cases, is not in itself all sufficient. The suggestive effect that the officer can exercise on his men in peace and in war is very important; in the fight it is the issue that turns the scale.—G. R.

An Appearance of British Pacifism. A newspaper report asserts that the Town Council of the town Bradford in England disapproved, by a vote of 38 against 30, permission for a proposed large "Retreat" celebration on armistice day anniversary because such a celebration of a military character would be in violation of the fundamental idea of the Kellogg pact. The same Council contemplates removal of the figures of a soldier and a sailor from the town's memorial monument to fallen soldiers in order that persons passing by the monument may not have warlike feelings aroused by such military displays.—G. R.

Book of Instruction for the Artilleryman. Following is an extract from an article published in the December 11, 1928, issue of the *Militär-Wochenblatt* in which the author comments on the newly issued German "Manual" of "Instruction for Recruits, Gunners, and Non-Commissioned Officers of the Artillery and their Instructors" compiled by Captain Gilbert, of the Fourth Artillery Regiment, detailed for service at the Artillery School: "Formerly in 'the golden days of the past' of our youth the 'Service Instructions for the Gunner and Driver of the Field Artillery' was a book that could be easily shoved into a side pocket and it comprised within itself all the wisdom that a good old artillerist could imbibe during his two years of service. Now it is a thick-bodied volume of 1150 large-sized, closely printed pages. This is not to be taken as a reproof but only as a quiet monition that the cord of the bow should not be drawn too tight. We are all of course aware how the stuff has become expanded and how the demands on officers and men have been stimulated in all directions and would ourselves be undecided on the question as to just what could be omitted. The book is intended to serve everyone, the recruit as well as the advanced artilleryman. Thus the one must take into his reckoning much that is incomprehensible to him while the other passes by much that is to him self-evident; each will soon come to an understanding of his several part; what is offered is in itself a model of what has been accomplished; it handles exhaustively the whole scope of their arm, furnishes instruction and information on every question that forces itself into recognition in and out of the service. The author knows how to present his subject simply and clearly whether it involves army affairs, interior service of infantry or artillery training, horses, guns, fire, and fighting. We can only wish for the book an extended distribution, not only within the circles of the young Reichswehr soldiers but also among our older artillerists and their sons and grandsons, so that the inspiration of the highly esteemed inspector of our arm for so many years, General of Artillery Bleidorn, may be fulfilled when he says: 'Our weapons they can smash up but not our spirit.' "—G. R.

Germany's Military Political Situation. A German military journal, alluding to the constantly reiterated fairy tales of the menace of German military aspirations present and prospective against the peace of Europe and more particularly against the countries immediately adjacent to it on the East and West, presents the following outline of the present comparative military strength of Germany to the nations most directly affected by that "menace."

According to the views of General Groener, the German minister of Defense, "the deciding factor in estimating the comparative military strength of one nation to another is the ratio of the standing army to the reserves. France can, in ten days after mobilization, assemble 45 fully armed and well-trained divisions across its Eastern boundary; a fighting force of about 1,200,000 men. It has full equipment on hand in storage for such a force and also for a second contingent of about the same strength to follow it immediately. This is no secret but is well known and generally admitted.

"Following is an exhibit of the military strength and resources of Germany and the nations immediately adjacent to it on the East and West:

	Peace Strength	*War Strength*
France	678,000	4,500,000
Belgium	66,800	600,000
Czechoslovakia	140,000	1,300,000
Poland	200,000	2,000,000
Rumania	144,000	1,000,000

"On Germany's Western boundary there are on hand and available for each 10 kilometers of boundary line military equipments as follows:

	France	*Belgium*	*Germany*
Flying craft	36	15	0
Tanks	41	14	0
Artillery guns	51	58	0.7
Heavy machine guns	318	187	0.2
Light machine guns	258	75	2
Soldiers, incl. reserves	1153	8506	243.0

No heavy guns for Germany.

"On the Eastern boundary of Germany for each 10 kilometers:

	Poland	*Czechoslovakia*	*Germany*
Flying craft	5	3	0
Tanks	1	0.6	0
Guns	10	7.0	0.7
Heavy machine guns	22.0	88.0	0.2
Light machine guns	32.0	42.0	2.0
Soldiers, incl. reserves	1153	8506	243.0

"But still, according to frequent press reports of the nations adjacent to Germany that are intent not only on retaining their present military forces and equipments but increasing them, 'Germany is a dangerous menace to the peace of Europe and to them,' although its comparative numerical military strength is in the proportion of about 1 to 30 and in its military equipment Germany is deprived of tanks, fighting airplanes, and heavy guns. In case of an actual conflict the chances for Germany would seem to be somewhat discouraging to say the least."—G. R.

STATISTICS OF OFFENSES AGAINST DISCIPLINE IN THE GERMAN REICHSWEHR FOR 1926. A writer in the *Militär-Wochenblatt* for November 28, 1928, states that delay of publication of reports of military delinquencies in the German federal army for a period of nearly two years is somewhat unusual but explains that the delay is due, in part at least, to assembly in proper form of the many details involved in the final summary.

From observation of the number of all convicted of military offenses from 1922 to 1926 it appears that the total has, after counting out a temporary increase for 1923, been materially reduced since 1924, namely: from 2.94% to 1.35% of effective strength of the troops. This is a reduction of numbers of offences from those of 1913. There is good reason to believe that the two following years of 1927 and 1928 will show a still greater reduction.

Of these convictions those pertaining to the more important military delinquencies are naturally of greater interest, namely: desertion, insubordination, abuse of service authority including personal abuse and ill treatment, and crimes against military property. The crime of desertion has been decreasing continuously from 0.48% to 0.12% so that in 1926 there was approximately only one desertion to 1000 men, but even so the percentage for this is relatively still too high. A reason for this may, to some extent at least, be due to the long period of enlistment (12 years imposed by the treaty of Versailles). Delinquencies involving infractions of military duties have also (exclusive of the temporary rise in 1923 when the troops were engaged in suppressing revolts and disorders of the population in the interior)

been very greatly reduced, namely, from 0.47% to 0.12%. In connection with this it may be noted that about ¼ of the offences of this nature were due to drunkenness.

Offenses of serious insubordination, involving acts of violence against superiors (mutiny and instigation to mutiny), have also been reduced in like measure and of those about two-thirds were committed by men when intoxicated. Convictions for offences against military property have also decreased from 0.75% to 0.32%. The circumstance that soldiers in the comparatively well-paid army dispose of better financial means than ever before carries with it, in their close association, temptations to violations of property rights. A reduction of the number of offences of this class is very gratifying. Delinquencies involving abuse of military authority and mistreatment of subordinates have remained about the same from 1922 on. It is incumbent on the higher authorities to keep a watchful eye in this direction.

In distributing the numbers of men convicted to the separate years since 1919 and 1920, it appears that those two years were *exceptionally criminally distinguished*, but this distinction disappeared after 1920 when the disorderly after-war elements contributing to it had been eliminated.—G. R.

Rivista di Artiglieria e Genio, November-December, 1928

The Problem of the Infantry Grenade. By Start.

The Tactical-Technical Reconnaissance of Roads During Operations Involving Open Warfare, With Special Reference to Bridges, Viaducts, Tunnels, Etc. By Col. Ettore Ciaretti, Eng. Corps.

Offensive Armed Forces and Defensive Armed Forces. By General Ambrogio Bollati.

Study on the Theory of the Muzzle Brake. By Lieutenant Ermanno Ravelli, Artillery.

The Future War. By General G. Douhet.

Notes on the Romani Telephone Switchboard, Antiaircraft Type. By Lt. Col. Alessandro Romani, Engineer Corps.

With the Telegraph Operators of the Carso. By General Giovanni Grisolia.

Rivista Marittima, November, 1928

For Aerial Warfare. By General G. Douhet.

Introduction and Development of Short-Wave Radio in Italy. By G. Pession and G. Montefinale.

The Electric Propulsion of Warships. By Captain Luigi Barberis, Construction Corps.

Loss of the Submarine F 14.

The Action of August 28, 1914 in the Gulf of Heligoland. By Commander R. de Courten.

Rivista Militare Italiana, November, 1928

Vittorio Veneto. By Ugo Cavallero.

The Reserve in the War of Masses. By Major Faldella.

Questions Relating to the Employment of the Artillery in the Preparation of the Attack in Open Warfare. By Col. Targa.

May There Still Exist a Law of War? By General Bollati.

Discussing Military Expenses at Geneva. By Prof. Zugaro.

L'Universo, November, 1928

Tripolitan Sahara.

Lero. By F. Bertonelli.

The Topographic Representation of Rocks. By U. Castellani.

Rivista Marittima, December, 1928

On Aerial Warfare. By Rear Admiral G. Valli.

A German Opinion on the Supremacy of the Air.

Comparison of Land and Sea as Bearing on War. By Commander Berardi.

Considerations Upon Some Characteristics of the Principle Types of Surface Vessels. By Commander G. Tioravanzo.

The Number of Propellers for Maximum Efficiency. By Comd'r. Leonardo Fea, Construction Corps.

Rivista Militare Italiana, December, 1928

Military Geography Notes on the Mediterranean. By General Deambrosis.

The Reserve in the War of Masses. By Major Faldella.

Permanent Mountain Fortifications. By Colonel Ferreri.

Questions of Maritime Logistics. By Commander G. Fioravanzo.

Rivista Aeronautica, December, 1928

Divagations on the Integral Problem of War. By Guilio Douhet.

Considerations Upon Aerial Warfare in Relation to Surface Warfare. By Colonel Riccardo Moizo, Arty.

Note Upon Reconnaissance Airplanes. By Colonel Cesare Antilli.

European Air Politics. By Lt. Col. G. M. Beltrami.

Aerial Observation in Coast Artillery Firing. By Lt. Col. Pasquale Salvatores.

The author briefly discusses the subject of observation by means of captive balloons and shows that it has marked limitations though possessing obvious advantages over terrestrial observation. He states that the greater number of such limitations may be obviated by using seaplanes and while refraining from indicating any system he refers to simple and rapid methods for locating the position of an enemy vessel and for the successive control of the fire of one's batteries.

After touching on the excellent results obtained during the last war with aerial observation in land firing he urges that special effort be made to overcome rapidly the difficulties now encountered in observation of seacoast firing.—F. E. H.

The Aerial Attack of Ships. By Lt. Comd'r. Franco Maugeri.

The Meteorological and Aerological Service During the Mediterranean Flight. By Filippo Eredia.

Static Tests of Metal Wing Spars. By Captain Corrado Gustosa.

Air Touring and Aeronautical Sport. By Renato Ranalli.

L'Universo, December, 1928

The Earthquake of March 27, 1928, in the Prealpi dell'Arzino. By Michele Gortani.

The IIIrd General Assembly of the International Astronomical Union.

The XXVIIIth Reunion of the Astronomishe Gesellschaft. By Luigi Carnera.

The XXIIIrd International Congress of the Americas at New York. By Lidio Cipriani.

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. W. E. COLE, *Colonel, Coast Artillery Corps, President, Coast Artillery Board.*

Project No. 687, Adoption as Standard of Camera Method of Measuring Deviation of Bursts for Antiaircraft Artillery.—The Coast Artillery Board was requested to submit comments and recommendations reference to the adoption of the camera method of measuring deviation of burst as the standard method of measuring deviation of burst for all antiaircraft gun target practices. The Board has recommended that this method be adpoted as standard, and that the Camera Unit of two cameras (known as the Jackson Camera, or Antiaircraft Spotting Unit T-1) be adopted as standard for manufacture and issue.

Project No. 688, Issue of Radio Set SCR-54-A.—The Board was requested by the Chief of Coast Artillery to submit comment and recommendation concerning the desirability of issuing the SCR-54-A radio set pending the availability of the SCR-136 set. The Board is of the opinion that the SCR-54-A radio set is entirely unsuitable for fire-control purposes and recommends that if a more suitable set than the SCR-54-A is not available for immediate issue, the provision for radio equipment for long-range batteries be held in abeyance pending the development and issue of suitable equipment.

Project No. 689, Training of Aerial Observers.—A program of special firings for the training of aerial observers has been prepared.

Project No. 690, Light-Weight Demountable Observation Tower for Railway Artillery.—A battery commander of the 41st Coast Artillery (Ry.) has suggested the desirability of securing light-weight portable observation towers for railway artillery for use in field positions. The Coast Artillery Board is of the opinion that a tower meeting the requirements laid down by him is suitable for use as an observing station and believes that such a tower should be regarded as an essential item of the fire-control equipment of a railway artillery battery. It has been recommended that such a tower be purchased and shipped to Fort Kamehameha for test by the 41st Coast Artillery.

Project No. 691, Blast Shield on 75-mm. Subcaliber Equipment for 14-inch Gun, Railway Mount, M1920.—While the Coast Artillery Board has no information as to the effect of the blast of 75-mm. subcaliber equipment for 14-inch Gun, Railway Mount, M1920, from a study of drawings submitted, the Board is of the opinion that if a shield is necessary, the design shown on the drawings is satisfactory. The Board concurred in a suggestion made by the Chief of Ordnance that such a shield be manufactured and submitted to service test at Fort MacArthur.

Project No. 692, Service Test of Improved Monocord Switchboards, Six and Twelve-Line.—Improved monocord switchboards, embodying the following new features, have been received and will be subjected to service test:

The Switchboard is housed in a carrying case so that it can be operated in the open in ordinary inclement weather. The upper half of the front of the carrying case, when open, affords protections from the weather to the face of the switchboard units, and the lower half of the front provides a shelf for holding a message blank or other material to aid the operator in making notes.

The operator's set, including talking, ringing, and night alarm circuits, is included in the switchboard case.

A folding breast transmitter and double head receiver are furnished as part of the switchboard and are connected to the operator's panel by means of plugs and jacks.

The operator's panel carries switches for the transmitter battery and night alarm circuit, a small lamp for illuminating the face of the switchboard units, and emergency binding posts for the transmitter or receiver.

A compartment is provided in the carrying case for holding the transmitter, receiver, and night alarm battery, and space is provided for two spare batteries.

A terminal strip is permanently connected to the switchboard through a ten foot length of cable.

Project No. 693, Test of Glider Targets and Targets Towed In Formation.—During the concentration of the 61st and 62d Coast Artillery (AA) at Fort Story this spring there will be certain firings conducted at glider targets and at targets towed in formation. At the conclusion of these tests the Board will submit its recommendations as to—

a. The suitability and advisability of adopting the glider target as a form of training for antiaircraft artillery.

b. The employment of targets towed in formation for training of antiaircraft artillery.

Of the two groups which go to make up the pacifist movement, the first group are not pacifists at heart, but are cleverly, stealthily, and craftily using the cloak of pacifism to attain their ends. These are the advocates of bolshevism, sovietism, communism, and similar revolutionary theories. They seek to overthrow the firm foundations of our country by force. They realize that the first step in a successful revolution by force is to weaken the country's means of defense.—Assistant Secretary of War, Dwight F. Davis.

BOOK REVIEWS

Some Elements of Tactics. By F. S. Besson, Major, Corps of Engineers. Washington: The Society of American Military Engineers. 1928. 6"x 9". 60 p. $1.00.

This is a collection of twenty-six problems illustrative of as many different principles of tactics. The author presents his subject matter in a novel way. He feels that the most important task of a military commander is to make decisions and that decisions come from the addition or application of tactical principles to situations. He therefore illustrates each principle by starting with a situation, shown on a sketch map accompanying the problem. To this he adds the elements affecting the situation—objective, time, etc.—and from these he leads the student to a decision.

The volume is not a text book, complete in itself, but it will supplement any text book on tactics. Its principal value lies in the aid which it will afford to military students in the solution of tactical problems, but it also will be of assistance to instructors whose duties require them to prepare problems. It is particularly recommended to those who are engaged with correspondence courses.

Emperor Francis Joseph of Austria. By Joseph Redlich. New York: The Macmillan Company. 1929. 5¾"x 8½". 547 p. Il. $5.00.

Although termed a biography by its author the book is in reality a study of the effects caused by Francis Joseph upon the course of events of his time—his influence upon the other institutions of the state—simply because he was the Emperor, not because he was Francis Joseph. He was, in fact, only a mediocre man endowed by nature and early training with a strong personality which was guided by just two principles: his belief in legitimacy of his reliance in the army. He was the last absolutist; in the twentieth century and with the forms of constitutional government, he steadily refused to believe in nationalism or liberalism. He was so unshakably steadfast in his legitimist faith and so impregnable in his control of the army that he could afford to be curiously opportunistic in actual affairs.

To him the ideal state was a monarchy by divine right, served by bureaucracy, guarded by police, and supported by bayonets. He was cool, aloof, and reticent. In his dealings with men he could be singularly heartless. In public affairs, whether internal or foreign, he was absolutely without a conscience. Quoting from the chapter "His Own Foreign Minister" we find "the reason for this want of understanding is not far to seek. Francis Joseph lacked the capacity for any deeper insight into the facts and forces of human life. . . . At this period (age 22 years) he certainly was far from seeing personality as the strongest force in life; later, too, such a view hardly visited him. . . . For him as for most *rulers,* personality as such had no attractions. Unfortunately for him his own personality was so strong, that even in his early youth, he was immune to charm—often dangerous charm—of strong individuality in others."

Although infallibly manifesting these characteristics to the end and with a seeming insensibility to the disasters resulting therefrom, his personality finally became enabled to

such an extent that he retired from intercourse in human affairs leaving a memory of respect and even love in the minds of his former subjects.

The book is a great theme done by a competent writer with definiteness of purpose and mastery of touch. The chapters on constitutional history are the best, but those on general history and personalities are also excellent. The style is solid, serviceable, and ponderous without being dull. The pages contain an excessive number of typographical errors which somewhat jar the serenity of the reader.—J. L. W.

Range Finders. By the Duke de Gramont, D. Sc. New York: Brentano's & Co. 1928. 5″x 7½″. 109 p. Il.

In view of the increasing use of range finders in the service, artillery and other officers will find much information of theoretical and practical value in *Range Finders*, by the Duke de Gramont, D. Sc.

After a general description of methods and the various instruments employed as self-contained range finders, the author discusses at length the theory, optical systems, and mechanics of the stereoscopic and coincidence types of range and height finders. Paragraphs are devoted to precision and accuracy of telemetric measurements and cause of error.

A comparison is made between these two types in the final chapter, in which data and curves obtained at dusk indicate the superiority of the stereoscopic type for work under adverse conditions of light. It is stated that, with the exception of men with really defective sight, the absence of the stereoscopic sense has not been observed and that systematic tests of men with normal vision should soon determine those possessing the necessary qualifications for becoming good observers.

Numerous diagrams, curves and photographs illustrate the test.—E. G. C.

All The World's Aircraft. Edited by C. G. Grey. Compiled by Leonard Bridgman. London: Sampson Low, Marston & Co. 1928. 8″x 13″. Il. 2 Guineas.

This eighteenth issue of *All The World's Aircraft,* which is just as elaborate and interesting as its predecessors, brings the history of aviation progress in every country up to date.

Part A, "The World's Aeronautical Progress," consists of a series of historical notes on the year's work of each nation in military, naval, and civil aviation, together with the names and addresses, where obtainable, of the aeronautical officials, departments, associations, and publications of the various nations.

Part B, is devoted to purely "Service Aviation History" and contains a complete directory of the aircraft commands and stations for each nation.

Part C, "All The World's Aeroplanes," contains detailed information on airplanes and airplane producers. In this part, all countries which are known to have produced airplanes within the past year are placed in alphabetical order and the machine built therein are described and illustrated.

Part D, "The World's Aero-Engines," is treated in the same style as Part 'C'. Detailed description of the various aero-engines of each nationality is alphabetically arranged.

Part E, "The World's Airships," contains the post-war developments in airship construction in Great Britain, France, Germany, Italy, and the United States. It includes detailed descriptions of the great airships of the present day.

The entire book is profusely illustrated in a style similar to that of *Jane's Fighting Ships.* It is a reference book of great value to anyone interested in the past history and present development of aviation.—J. L. W.

The ABC of Aviation. By Victor W. Pagé, Major, U. S. Air Corps Reserve. New York: Norman W. Henley Pub. Co. 1928. 5"x 7¼". 160 p. Il. $1.00.

As stated by the author, the purpose of this book is to assist the layman in becoming airminded. The particular method employed is to acquaint the reader with the elementary mechanics of aviation in order that familiarity with the technical features of aircraft may overcome some of the feeling of mystery with which the general public surrounds aviation.

The subject matter is divided into five chapters treating respectively of Lighter-Than-Air-Craft, Heaver-Than-Air-Craft, Airplane Construction, Engine Types and Propellers, and Airplane Control and Flying Instruments. It is presented in a simple manner that should be easily understood by the average layman.—J. L. W.

The Law in Relation to Aircraft. By Lawrence Arthur Wingfield, M. C., D. F. C., and Reginald Brabant Sparks, M. C. New York: Longmans, Green and Co. 1928. 5½"x 8½". 304 p. $5.00.

It was early found, in the flying game, that unrestricted flying could be no more permitted than unrestricted automobile driving. Agencies for the control of aviation came into being, and gradually, as the necessity developed, legal and other restrictions were imposed with a view to making aviation as safe as practicable for both the man in the air and the man on the ground. Today the question of aviation and its control has reached international proportions.

The authors have collected in one place the regulations and laws with which an aviator should be familiar. The body of their book is concerned principally with British restrictions and much of the appendix is taken up with British regulations and laws. There is, however, enough of international requirements in the volume to make it worth having, and any aviator who contemplates flying in British territory should certainly study the book.

Sixty-four pages are devoted to discussions of international regulations of air navigation, general principles of English law, airdromes, regulation of aircraft, personnel of aircraft, flight, and the investigation of accidents. The remainder of the work, in the form of an appendix, presents various documents, as the International Convention, 1919; Air Navigation Act, 1920; Air Navigation Directions, 1926; and Airworthiness Handbook for Civil Aircraft. An index enhances the value of the book.

Citizenship Through Problems. By James B. Edmonson and Arthur Dondineau. New York: The Macmillan Company. 1928. 5¼"x 7¾". 550 p. Il. $0.88.

Among the most important of the courses being taught in high schools today is that of civics. In this age of bolshevism, communism, and socialism it is particularly important that the youth of the country be thoroughly imbued with the idea of good citizenship, and for this a knowledge of citizenship and of community life is a prime necessity.

The authors, recognizing a need for interesting the young student, have attempted "to perpare a textbook that differs from all other books in community civics in certain important respects." They make use of the applicatory system—so dear to the heart of the military pedagogue—but they leave sufficient flexability to meet the needs of individual instructors. To supplement the text, another volume, *A Pupil's Workbook* (8½"x 11". 193 p.), is provided for notebook work and tests. These books proved their value through trial while in manuscript form, and they might well be included in any reading course in civics.

Andrew Jackson: The Gentle Savage. By David Karsner. New York: Brentano's. 1929. 5½"x 8¼". 399 p. Il. $3.50.

This is an excellent story of the life of the great Militant Democrat. His personality, a most colorful one, is accurately sketched; but this very accuracy does much to destroy the implication of the subtitle. Andrew Jackson was a savage even for a savage time on a savage frontier. As a youthful public prosecutor he personally arrested delinquent debtors at the point of his pistol. As a judge he challenges to duels those who appear in his court. As a husband protecting his wife's good name he engages a superior marksman, allows him to fire first, and while wounded cooly sends a ball through his opponent's body. As a general he signs the death warrant of six country boys who were honestly mistaken as to the term of their service. In the Indian wars he lays waste village after village in gory slaughter. And he leaves the high office of President regretting that he never had an opportunity to hang John C. Calhoun or to shoot Henry Clay. High handed, imperious, brooking no will but his own, he lapses into gentleness only within the gates of the Hermitage.

Jackson's military career is but sketchily described, being used more as a background on which to project his personality. The causes of the War of 1812 are described only as they appeared to the people on the then Western frontier. All were eager to fight their old enemies, the British, and all wanted more territory. Jackson entered this war as a Major General of the Militia and in 1814 was made a Major General in the Regular Army, although up to that time his victories had been against the Indian allies of the British. But he soon repaid his country by his brilliant victories at Mobile, Pensacola, and New Orleans. This last victory gave him the great following among the people who three times gave him the largest popular vote for the Presidency. But the first election was thrown into Congress where reactionaries caused his defeat.

Mr. Karsner has written a colorful book of Andrew Jackson and his time. It is as readable as a novel and hides neither his faults nor his virtues.—H. C.

The Flight of the Southern Cross. By C. E. Kingsford-Smith and C. T. P. Ulm. Robert M. McBride & Co. 1929. 295 p. Il.

There are four books that should rest side by side on the library shelves of those who pretend to keep abreast of the wonderful age in which we are living: *We*, which takes us to Paris with Lindbergh; *Record Flights* in which we are carried to Germany with Chamberlain; wherein we accompany Byrd to his historic wet landing, at Ver-sur-Mere and now *The Flight of the Southern Cross* which transports us across the Pacific to Australia. To each one of these narratives there is a similar objection. Being written by one of the principals of the voyage in each case, we suffer a loss in reading from the modesty which each one displays in writing. There is a certain indescribable something missing in the pages—which well becomes the writers to have omitted.

The authors of *The Flight of the Southern Cross*, possibly, give us more technical details of their preparations than is true in companion books. We learn of wing loading, power loading, and composite loading. We read in detail of the technique of blind flying and of the various instruments to assist therein. Problems of navigation and navagation instruments are covered. The personal training and preparation of the crew—in short, the account is complete from the end of the World War, when Kingsford-Smith first began to project his flight, until the Southern Cross landed at Sydney.

Certain features stand out preeminently:

(1) The length of time spent in working up the flight.

(2) The personal and mechanical preparation.

(3) The financial difficulties encountered.

(4) The deadly monotony of the night hours.

(5) The terrific experience of riding the storm between Suva and Brisbane.

(6) The continual worry about gasoline consumption.

We read every word in the newspapers, avidly, of this great flight. Now it is really worth while to study over the actual details of the flight and see how it was accomplished. *The Flight of the Southern Cross* is the very readable account of a great achievement, well prepared and ably carried out.—B. F. H.

Those who wish to destroy all defenses against their own unbridled action and substitute the red for the red-white-and-blue, do not want our people to respect the flag any more than they want them to have faith in our established governmental institutions. They desire our flag to become only a piece of bunting, a rag, so that it will no longer serve as the rallying point of those who believe in home, country, and God. They are now working for the abolition of the Flag Day Exercises and are discounting all reverence to the flag. They are planning the abolition of our Army and Navy and the repeal of our National Defense Act. Disrespect for the flag, reduction of our military defenses, discontent with our form of government and its institutions, are the first steps in what is communistically termed the peaceful phase of the revolution. They know, and we must never forget, that disrespect for the emblem of our government fosters disrespect for that government.—Assistant Secretary of War Dwight F. Davis.

The Coast Artillery Journal

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Major Robert Arthur, C. A. C. . . . . *Editor*
Charles R. Miller . . . . *Business Manager*

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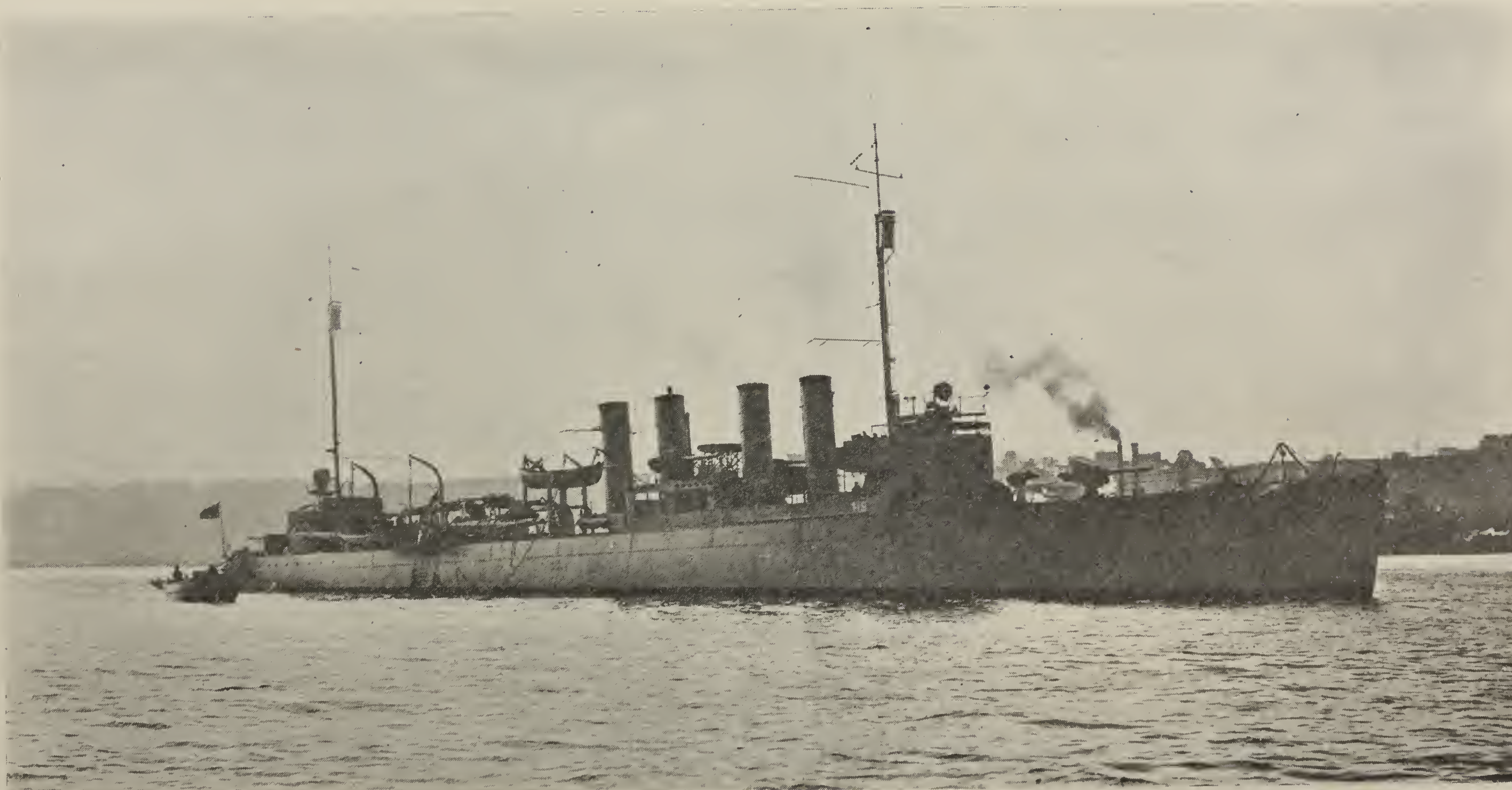

U. S. Destroyer Lamberton

Displacement: 1,213 tons. Length: 310 feet. Beam: 30¾ feet. Mean draft: 9½ feet. Speed: 35 knots. Armament: 4 4-inch, 1 3-inch AA guns; 12 21-inch torpedo tubes.

The Coast Artillery Journal

Volume 70 May, 1929 Number 5

The Role of the 37-mm. Full Automatic Antiaircraft Gun

By Major J. C. Haw. C. A. C.

Third Prize, Annual Essay Contest

FOR several years the Ordnance Department and the Colt Patent Firearms Company have been engaged in the development of a mobile 37-mm. full automatic antiaircraft gun and carriage. This development has now progressed to the point where success seems practically assured. However, it is believed that certain important phases of design have been neglected because of a general failure to visualize the tactical rôle which the 37-mm. should fill. That such a condition should exist is only natural, because up to date the gun has been purely an experimental proposition.

The purpose of this paper is to investigate the characteristics and possibilities of the 37-mm. gun and the different ways in which it might be employed, and to deduce from this investigation the trend which further development should take and the principles which should govern the organization and the tactical employment of troops equipped with this weapon. The necessity for such a study is evident when one considers the time, effort, and money which might be lost by an erroneous decision at this stage of progress.

The writer had the privilege of observing the 37-mm. gun throughout the 1928 Aberdeen tests, so he possesses a certain amount of first-hand information concerning it; but as for accurate statistics, the experimental nature of the project has prevented the publication of anything very definite. However, it is felt that by a careful consideration of the few figures which have been published it will be possible to arrive at approximations sufficiently accurate for our purpose.

The gun is described as follows in par. 11*a*, TR 435-30:

> *The 37-mm. antiaircraft gun.*—This gun has a maximum vertical range of 5000 yards. It fires a shell provided with a fuze sufficiently sensitive to produce detonation on contact with the airplane fabric. A hit on any part of an airplane may disable it or cause material damage. The fuze is provided with a fixed time element which detonates the shell in the air, thus making the weapon safe for use over friendly territory. The normal rate of fire is 80 rounds per minute.

It is at present mounted on a trailer carriage which is towed by an automobile truck. It can be placed in position or returned to march order very

Editor's Note.—*The views expressed are those of the author. The Journal would like to have a further discussion of the proper rôle of this important weapon.*

quickly, compared with the mobile 3-inch MI. It is equipped for fire by Case III, using a data computer. The ammunition employed in target practice is provided with tracers.

Since the capabilities, and consequently the tactical employment, of anti-aircraft weapons depend largely upon the range which they are capable of achieving, let us compare the ranges of the 37-mm. with those of the 3-inch and the caliber 0.50 machine gun. It is quite possible that the maximum effective ranges deduced in the following discussion are slightly greater than the two automatic weapons can achieve; on the other hand, fire-control apparatus for these guns is being improved so rapidly that our figures may eventually prove to have been too conservative. In any event, it is felt that these figures are near enough to the truth to serve as the basis for our conclusions.

In par. 8*e* of TR 435-30, as amended by changes 1, it is stated that the mobile 3-inch gun MI is effective to an altitude of 5600 yards at a horizontal distance of 5400 yards. The maximum vertical range of the gun, however, is given as about 8200 yards. Since the effect at the point of burst depends upon the explosive power of the bursting charge and not upon the remaining velocity, it is obvious that the term "effective range" as used in TR 435-30 is based upon accuracy of fire, and the phrase should be so understood in this article.

When it comes to the caliber 0.50 machine gun, TR 435-30 offers no such definite statement of effective range. The maximum vertical range is stated as 4700 yards and the maximum horizontal range as 6650 yards; the tracers are said to be effective to 2000 or 2300 yards (Par. 11*b*, TR 435-30). Considering these figures, the results of past firings, and the steady improvement in sights and data computers, it seems reasonable to assume that the caliber 0.50 machine gun will eventually be capable of delivering effective fire to an altitude of 2000 yards at a horizontal distance of 2000 yards; perhaps it can do so now.

As for the 37-mm. gun itself, the only definite range given is the maximum vertical range of 5000 yards. Since this weapon is distinctly a cannon and fires an explosive projectile, it may be assumed that the rule given in par. 9, TR 435-30, is applicable. This rule reads as follows: "For the purpose of arranging the gun defense, the fire is considered to be effective at altitudes up to about two-thirds of the maximum vertical range of the fuze and within a distance from the gun of about two-thirds of the maximum horizontal range of the fuze." Applying this rule, we arrive at 3333 yards—call it 3000 yards—as the maximum effective vertical range. There are no data available for the determination of the maximum distance at which the gun is effective to this altitude, but it is reasonable to set this limit at 3000 yards.

No doubt the critical reader has noticed that with an advantage of but 300 yards in maximum vertical range, the 37-mm. has been credited with 1000 yards greater effective range than that of the machine gun. It is felt that this is justified in view of the much greater weight of projectile and the superior muzzle velocity of the 37-mm., which together should insure a much higher degree of accuracy than can ever be expected from the caliber 0.50.

So much for maximum ranges; let us consider minimum ranges for a moment. The caliber 0.50 machine gun can be pointed so easily that it is capable of picking up a plane in two or three seconds and firing upon it until the plane is right on top of the battery, so to speak. The 37-mm. cannot be aimed so quickly, but once it has picked up an approaching target it can follow that target right on in. The 3-inch gun cannot be used advantageously against targets flying lower than 500 yards altitude. (Par. 9, TR 435-30.)

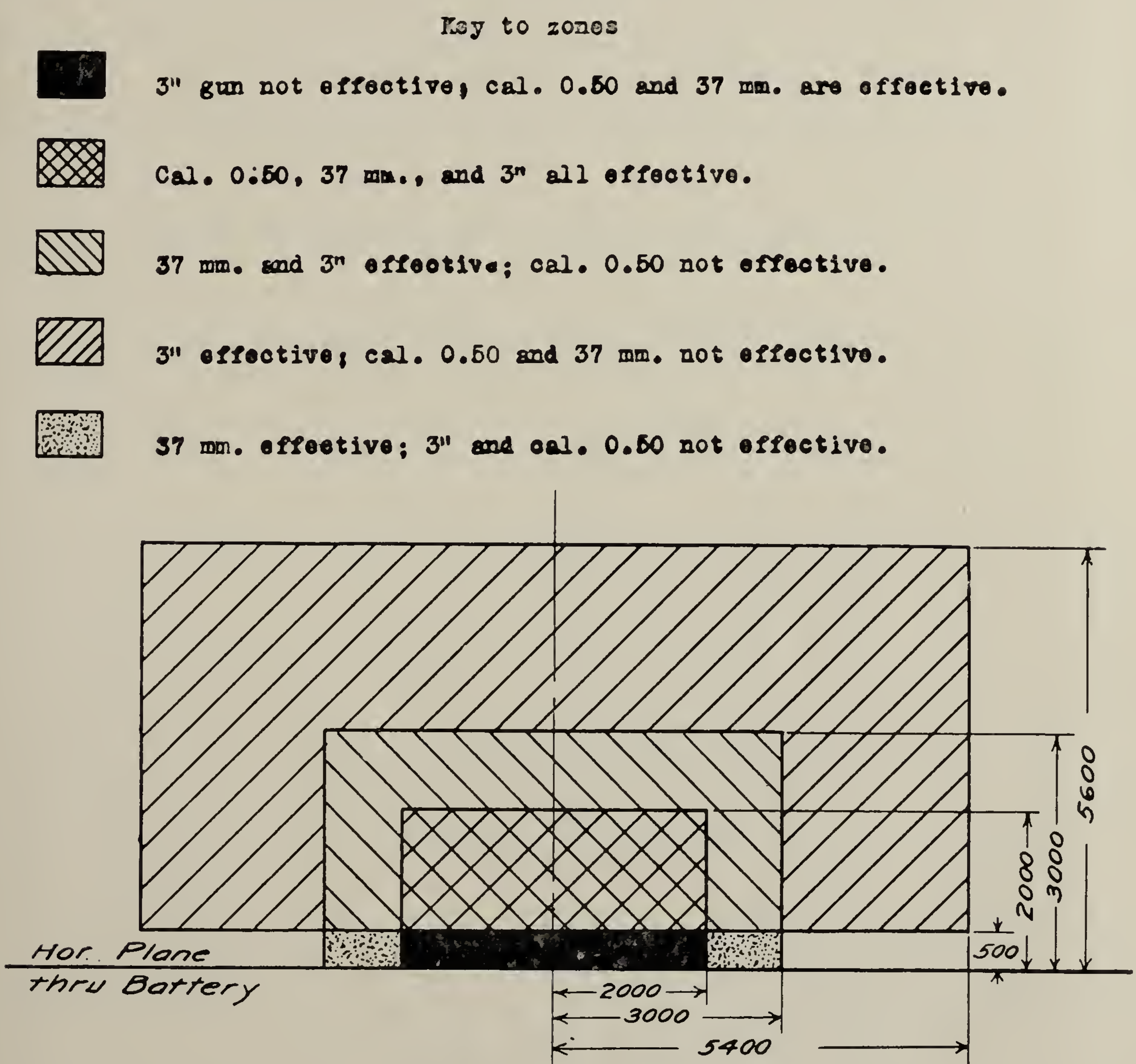

FIG. 1. ZONES OF EFFECTIVE FIRE. A PROJECTION ON THE VERTICAL PLANE

In Figures 1 and 2 all of these limiting ranges are represented graphically. Though not shown in these figures, there is of course a "dead space" immediately above each gun, since they will never be fired at 90 degrees elevation; however, for the purposes of this discussion these dead spaces may be ignored.

These diagrams show that the only zone covered by the 37-mm. alone, and not covered by either of the other weapons, is the zone below 500 yards altitude that lies in the ring between 2000 and 3000 yards distant from the battery.

The diagrams, however, do not convey an adequate conception of the difference between the horizontal area covered by the 37-mm. and that covered by the caliber 0.50, and still less do they show the truly tremendous difference between the volumes of space covered by the two weapons. According to our

assumed ranges, the caliber 0.50 should cover effectively a horizontal area of 12,566,400 square yards and a volume of space of 25,132,800 cubic yards; while the 37-mm. should cover 28,274,400 square yards and 84,823,200 cubic yards. (For the sake of simplicity, no deductions for dead spaces were made in these computations.) The 37-mm. should thus cover more than twice the horizontal area covered by the caliber 0.50 and nearly three and a half times the cubic volume covered by the latter.

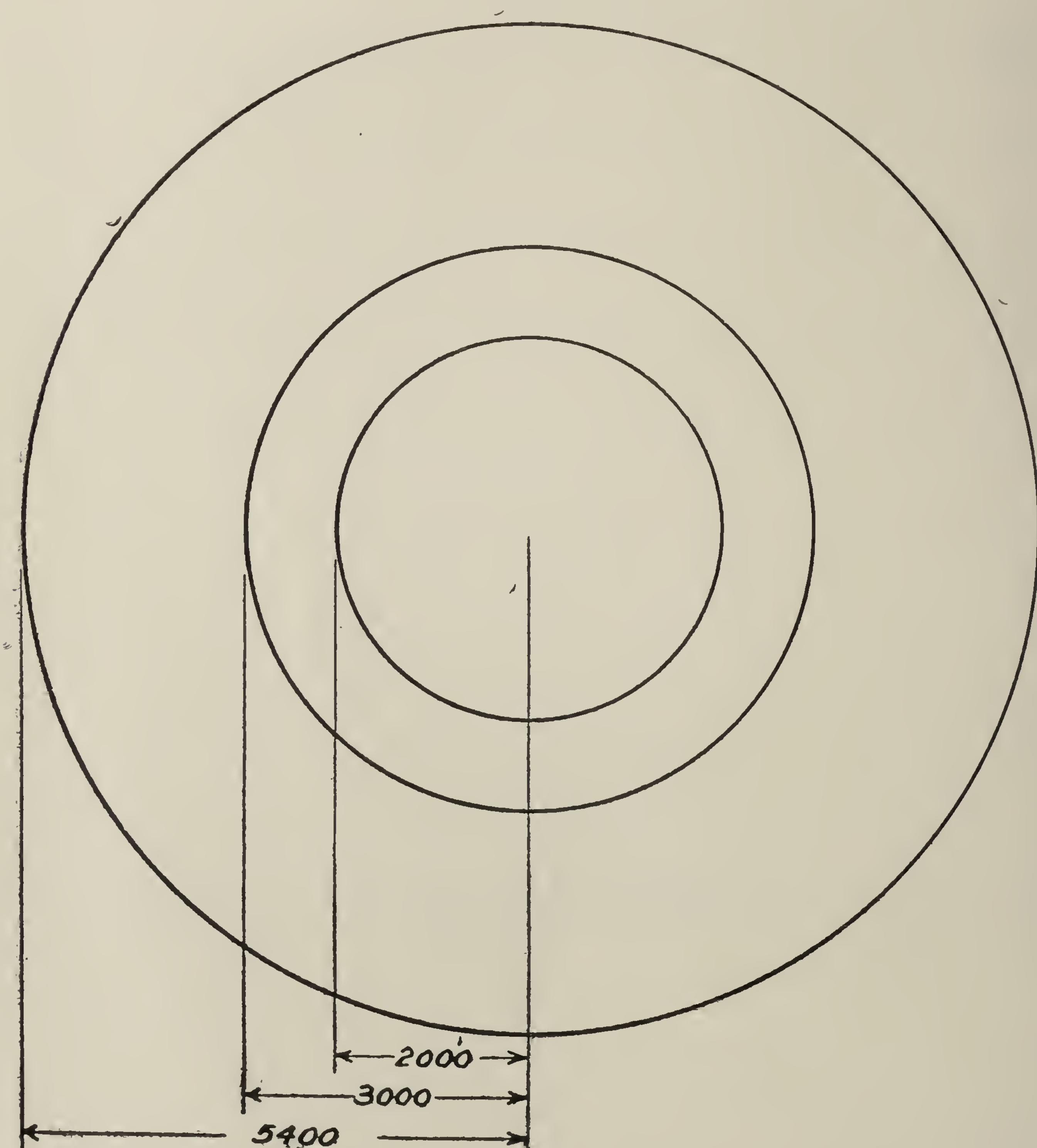

FIG. 2. ZONES OF EFFECTIVE FIRE. A PROJECTION ON THE HORIZONTAL PLANE

There are certain other characteristics besides range which should be mentioned in discussing these various weapons. The rate of fire of the 37-mm. gun is about five times that of the 3-inch, but only about one-fifth that of the caliber 0.50. With the present mount, the 37-mm. has to move off the road to go into the firing position, while the machine gun will be mounted so as to be capable of firing from the road. Being much lighter than the 3-inch, the 37-mm. can cross weak bridges and go across country with almost the same facility as the machine-gun truck and can travel almost as fast on the road.

Its explosive projectile is the greatest asset of the 37-mm. gun. Aircraft may sometimes be riddled by machine-gun fire and still function perfectly, but one hit of a 37-mm. shell should usually disable a plane.

Having arrived at an approximate figure for the limiting effective range of the 37-mm., it is essential that we consider what targets will be found within this limit for the gun to fire upon. Pursuit formations may be dismissed without further consideration, since antiaircraft artillery is not expected to accomplish much against this type of aircraft. Day bombardment ships will rarely fly as low as 9000 feet if they have the slightest suspicion that there is antiaircraft artillery in the neighborhood; night bombardment planes may occasionally fly this low, but not often. Thus the only types of aircraft that will normally be found within range of the 37-mm. will be attack and observation ships. Let us see what the gun can accomplish against these types.

Since 9000 feet constitutes the maximum effective range of the 37-mm., the utmost that that gun could possibly accomplish against observation aviation would be the absolute denial of altitudes below 9000 feet to this type of planes. To what extent would this hinder aerial reconnaisance?

In the rear areas, the observer is looking for large establishments, troop movements in force, and other elements and activities of the same general nature; practically all of these can usually be spotted from an altitude greater than 9000 feet. Hence the 37-mm. would not accomplish very much even if it should force enemy ships to that altitude in rear areas.

In the combat area, however, observers are trying to locate front line units, artillery positions, local reserves, and similar small and inconspicuous elements; so that in this area the 37-mm. would really accomplish something of value if it should succeed in forcing observation ships to fly higher than 9000 feet. Even here, however, the gun would be merely supplementing the work of the 3-inch.

Attack aviation remains to be considered. One of the major principles of attack operations—perhaps the major principle—is that of surprise. The tactics of this branch of the Air Corps are to secure surprise by flying very low indeed—"just above the tree-tops," as Air Corps officers usually express it. Obviously, then, antiaircraft artillery units will generally have practically no warning of the approach of attack ships until they suddenly appear at very short range and low altitude. Under these circumstances, the angular travel of the target is so great that only a very flexible aiming system will permit the gun to be laid in time to open fire before the target is gone. Unfortunately, the present 37-mm. aiming apparatus is not designed to meet this condition; so that the gun as mounted now would rarely ever accomplish anything against attack aviation.

This is especially regrettable in view of the fact that the small size and high rate of fire of the gun itself render it capable of very effective fire upon surprise targets, if it could only be aimed quickly enough. Although the entire system of fire control is but illy adapted to the task of picking up a close-in target in

two or three seconds, the chief delay would be caused by the difficulties entailed in getting the two observers at the data computer to locate the plane in the fields of view of their telescopes with sufficient rapidity. Since the same delay would occur if each gun were supplied with telescopic sights, the proper way to solve the problem would be to equip each gun with open sights. If practicable, too, the elevating and traversing mechanisms should be so designed that when surprise targets appear the regular mechanism may be thrown out of gear in an instant and the piece manipulated freely by a single gun-pointer. Tracer ammunition would be essential to this system, of course; the gun-pointer would use the open sight and then adjust his fire from observation of the tracers, the use of the data computer being omitted.*

These features should, of course, be merely supplementary to the regular Case III system of fire control, since the latter is by far the more efficient against all targets except those which appear suddenly at very short range.

In line with this phase of the discussion is the proposition of firing from the road when attack planes swoop down upon a column. As previously stated, the present type of trailer carriage must be moved off the road in order to emplace the piece for firing; since the time required to take up the firing position is a matter of minutes, the target would be gone long before firing could be started.

The caliber 0.50 machine guns, however, are to be mounted in such a way that they can be fired at any instant, on the road or anywhere else. Every effort should be made to accomplish the same thing with the 37-mm. No doubt there are many difficulties to be overcome, but the advantages are so tremendous that the effort is obviously worth while. Of course, this kind of mount would be useless unless the design provided also the features necessary for the prompt delivery of tracer fire on surprise targets. A modified form of trailer carriage may be the solution, since a self-propelled truck mount would be heavy and would make the gun conspicuous when located in forward areas.

We have now reached the point where we can consider the tactical possibilities of the 37-mm. It has been brought out that as at present mounted, the gun is practically restricted to the rôle of combatting observation aviation in the forward areas, and that even in this rôle it is merely a supplement to the 3-inch gun. If this be true, as we believe it is, it must be confessed that there appears to be no real place for the 37-mm. in the tactical scheme, and that its introduction would entail additional expense, difficulties of ammunition supply, and many other undesirable complications without an adequate return. It would seem, therefore, that nothing is to be gained by further development along the present lines.

On the other hand, if the 37-mm. could be so mounted as to be capable of delivering tracer fire upon surprise targets, the situation would be entirely different. In that event we would have a weapon which could do practically everything that the caliber 0.50 machine gun can do now, with a thousand yards

* During the World War the German Army had a small automatic cannon whose projectiles combined a tracer element with an explosive charge and percussion fuze.

more range and a projectile infinitely more deadly. What could be more logical, in these circumstances, than to supplant the caliber 0.50 machine gun by the 37-mm. as the principal automatic weapon of the antiaircraft artillery regiment? The expense would not be prohibitive; the ammunition supply would not then present undue complications; and the mobility of the new weapon would be sufficient to meet all demands.

Of course, the machine gun should be retained for the close protection of 3-inch gun batteries and for certain other secondary rôles for which it is peculiarly fitted by reason of its small bulk and light weight.

In the opinion of the writer, the 37-mm. can justify its existence in no other way than as the successor of the caliber 0.50 machine gun.

Before it can do this, however, it must demonstrate superior efficiency. All of the points which we have considered are secondary to the great issue—the number of planes which the gun can bring down. Neither rapidity of fire nor percentage of hits constitutes the true measure of efficiency of an antiaircraft gun; the final criterion must always be the number of planes disabled per unit of time. This is by no means synonymous with hits per gun per minute, for hits do not always bring down planes—especially machine-gun hits.

If there are no statistics which show the ratio of hits to planes disabled, actual firings at condemned ships on the ground will provide the necessary data. From target practice reports, the number of hits per gun per minute can be determined. With these two sets of figures, it will be possible to arrive at a reasonable conclusion as to the true relative efficiency of the caliber 0.50 machine gun and the 37-mm. automatic. Because of its deadly explosive projectile and inherent possibilities for superior accuracy, my money is on the latter.

Now assuming that the 37-mm. can be improved as advocated in this paper and that it turns out to be at least as efficient as the machine gun, what principles should govern its tactical employment? The answer to this is simple: Although the superior range of the 37-mm. may necessitate some minor variations, the general principles now recognized as governing the tactical employment of the machine gun will be applicable to its successor as well. This is true because the 37-mm. will fill the same place in the tactical scheme, but with increased efficiency.

Under the same assumption, namely the displacement of the machine gun by the 37-mm., the question of organization remains. The plan of organization must be based upon the firing unit, which may be either a platoon or a battery. For lack of a better standard, let us say that a satisfactory firing unit of 37-mm. guns would be one which has a sufficient number of weapons to make the unit as efficient as is the present machine-gun platoon, within the 2000-yard range of the latter. It is quite possible that this condition might be met by a firing unit of three, or even of two 37-mm. guns, with consequent economy of personnel and expense.

In order to determine the number of these firing units which would be required in a battalion, let us compute the areas and volumes which could be

covered effectively by various numbers of units, and compare these with each other and with similar figures for the caliber 0.50 machine gun. We have already noted these figures for single weapons; obviously, a firing unit of several weapons located immediately adjacent to each other can cover no greater area and volume, although they can cover that area and volume several times as effectively. The table which follows (Table I) presents the comparative data. For the sake of simplicity, no deductions were made for dead spaces immediately above the firing positions.

TABLE I

Weapon	*Number of firing units*	*Area covered (square yards)*	*Volume covered (cubic yards)*
		ONE BATTALION	
37-mm.	4	113,097,600	339,292,800,000
Cal. 0.50	12	150,796,800	301,593,600,000
Difference		—37,699,200	+37,699,200,000
		ONE BATTALION	
37-mm.	8	226,195,200	678,585,600,000
Cal. 0.50	12	150,796,800	301,593,600,000
Difference		+75,398,400	+376,992,000,000

We shall have occasion to refer to Table I later.

In this connection, there is another aspect of the situation which is not illustrated by a simple comparison of areas and volumes. Protection against low-flying attack planes is best achieved by placing the automatic antiaircraft weapons close to the objective to be protected. When there are a great number of scattered elements to be covered, therefore, it is advantageous to have a large number of firing units at our disposal.

As a final step in the consideration of the organization problem, we will stake out a concrete tactical situation on the map and solve it in various ways. Figures 3, 4, and 5 show an invading Corps, acting alone, occupying a defensive position on the north shore of Long Island; it is a typical American Army Corps of three divisions and Corps troops. The dispositions of the Corps, except for antiaircraft units, are identical in the three figures. All units of the Corps are present except the Air Corps and the motor elements of the Corps train; these are both located on the north shore several miles to the east of the east edge of the map, and both are covered by attached antiaircraft artillery units, leaving the Corps antiaircraft artillery regiment free to cover the remaining elements of the Corps. The Corps is supplied by motor elements of the Corps train, which deliver to the refilling points for divisions and for Corps troops. For the sake of simplicity, command posts and 3-inch antiaircraft batteries have been omitted. The circles represent arcs of effiective fire of caliber 0.50 or 37-mm. firing units, with radii of 2000 yards for the former and 3000 yards for the latter.

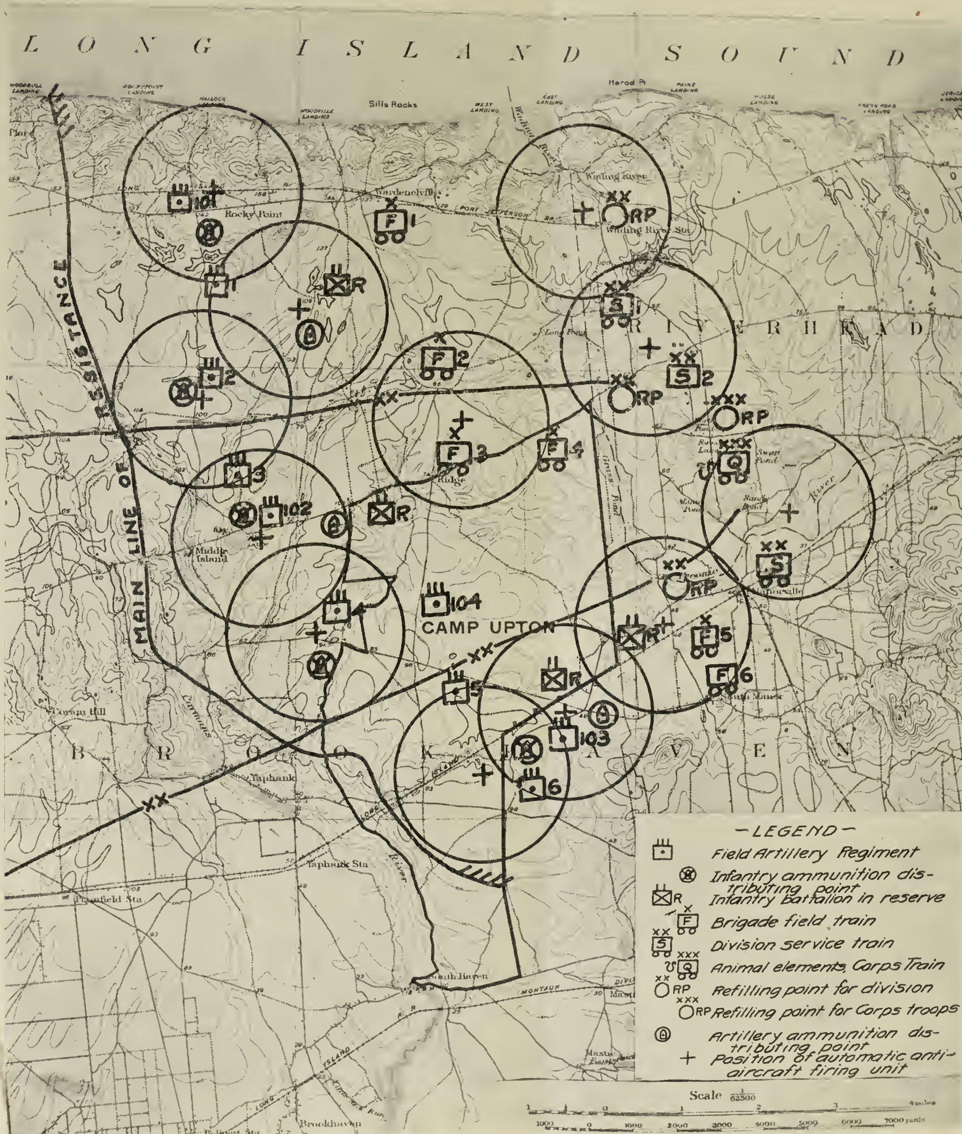

FIG. 3. BATTALION OF 12 MACHINE-GUN PLATOONS

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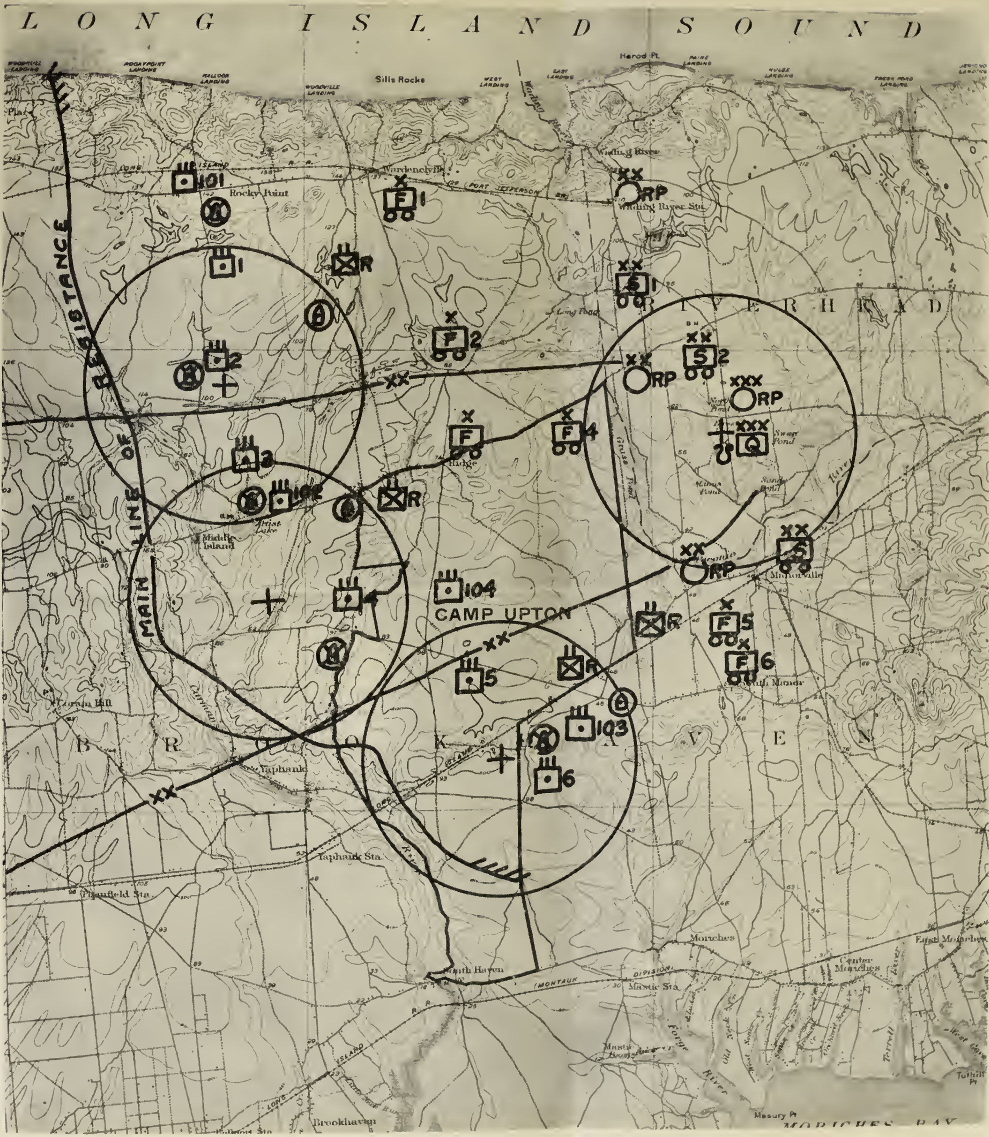

FIG. 4. BATTALION OF 4 FIRING UNITS—37-MM.

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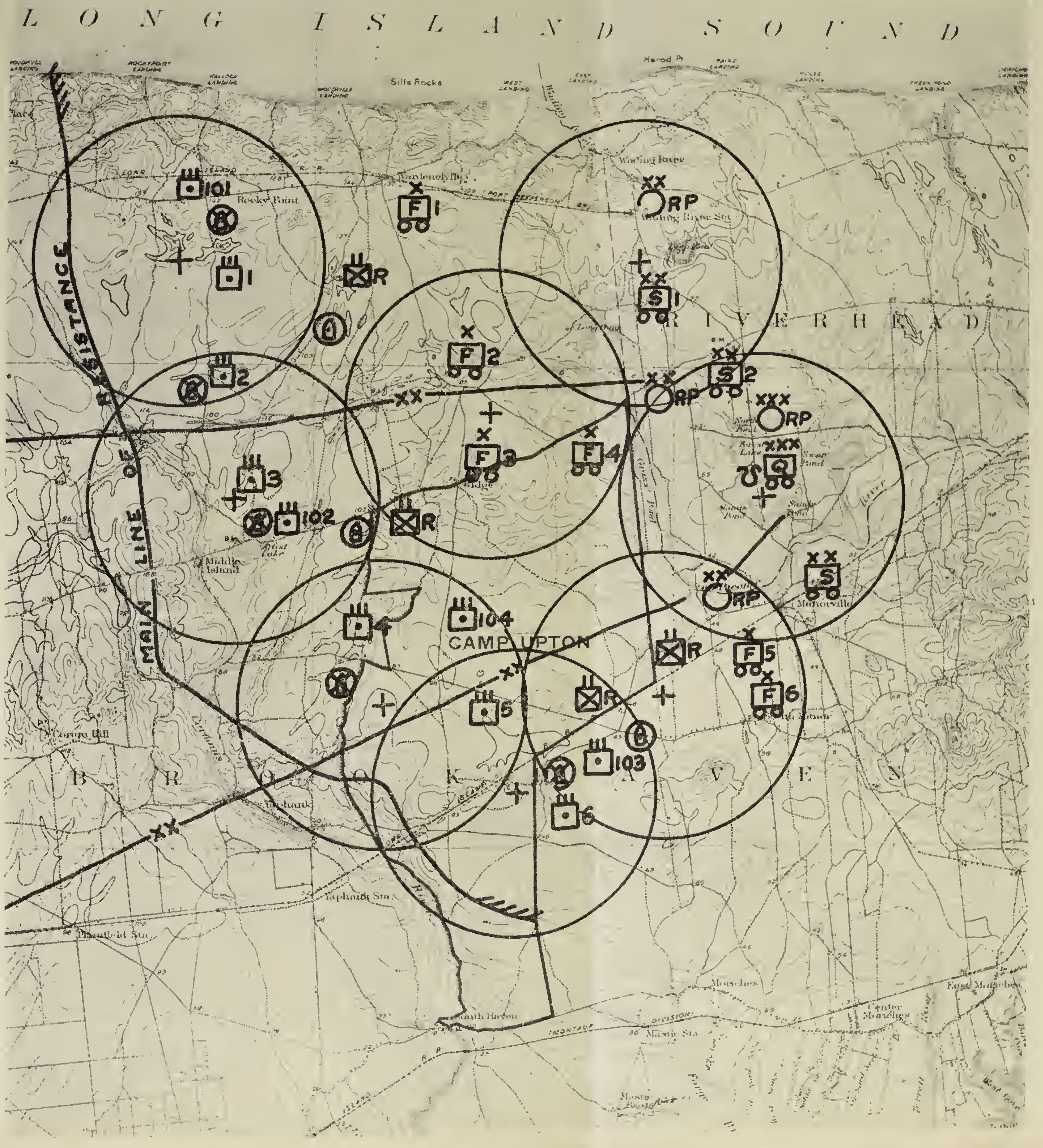

Fig. 5. Battalion of 8 Firing Units—37-mm.

The particular situation depicted, showing an independent Corps in a defensive position with three divisions in line, was chosen because it involves the maximum dispersion that will ordinarily occur and so places the most difficult task upon the antiaircraft artillery which that arm is likely to encounter. The main line of resistance is thirteen miles long and the rear elements shown are about seven miles in rear of it. In each solution, the writer tried to follow the precepts of TR 435-30, especially with regard to the dictum that on the defensive the machine guns (or 37-mm.) should be further advanced than in the attack (par. 57, TR 435-30). Especial attention was given to the left (south) flank, as the situation indicates that the enemy will probably attempt an envelopment of this flank.

Figure 3 shows a normal battalion of caliber 0.50 machine guns disposed to protect the Corps. Compare this figure with Figures 4 and 5.

Figure 4 illustrates possible dispositions of a battalion composed of four firing units of 37-mm. guns. An inspection of this figure, and a consideration of Table I and the discussion which follows Table I, indicate that such a battalion is incapable of covering a Corps properly when the Corps is well spread out in a defensive position.

A three-battery battalion of six firing units is a possibility, but would be a little awkward under existing Tables of Organization. The four-battery battalion is eminently suitable for the Corps of three divisions and Corps troops, since one battery may care for each division while the fourth is devoted to the protection of the Corps troops and trains.

In Figure 5 we have the possible dispositions of a battalion composed of eight firing units of 37-mm. guns. Although two or three elements are uncovered, it is obvious that a plane approaching from any direction except the north must pass over at least one firing unit *en route* to these unprotected elements. A consideration of this illustration, together with Table I and subsequent discussion, leads to the belief that eight 37-mm. firing units could cover a Corps a great deal more effectively than could the twelve firing units of a machine-gun battalion. Such a 37-mm. battalion should be organized into four batteries of two firing units (platoons) per battery. So much for organization.

As yet, nothing has been said as to danger for our own ground troops from 37-mm. fire. This danger will be largely obviated by the safety time element of the fuze, already mentioned in the description of the gun quoted from TR 435-30. As for shells which happen to strike the ground before this device has time to function, it is probable that the 37-mm. is no more dangerous to ground troops than is the caliber 0.50 machine gun, which puts five bullets into the air for every shell fired by the 37-mm.

In closing, the conclusions reached in this discussion may be summarized as follows:

While the 37-mm. full automatic antiaircraft gun is a weapon of great promise, the limitations imposed by the present design of mount and fire-control apparatus reduce its sphere of usefulness to such an extent that further development along the same line would appear to be unprofitable.

On the other hand, there is good reason to suppose that the gun mount and fire-control apparatus can be so designed as to make the 37-mm. capable of meeting surprise targets by tracer fire, while retaining the present advantageous features; and it is quite possible that these improvements could be augmented by arrangements which would permit the gun to be fired from the road with a delay of only a few seconds. In any event, the future development of the weapon should be directed along these lines.

If these things can be accomplished, statistics should be gathered (by extensive firings if necessary) to show the true relative efficiency of the caliber 0.50 machine gun and the 37-mm. gun in terms of planes disabled per unit of time; and if the efficiency of the latter equals or surpasses that of the machine gun, it should supplant that weapon as the principal light armament of the antiaircraft artillery regiments.

In this event, battalions of 37-mm. guns should be organized into four batteries of two platoons per battery, each platoon to be equipped with a data computer and the minimum number of guns necessary to constitute an efficient firing unit.

The tactical employment of such organizations should be governed by the general principles now recognized in the tactical employment of organizations armed with the caliber 0.50 machine gun.

***I believe that the finest thing about these summer camps is their spirit of American democracy. . . . Here are camps which offer the same opportunity to all young men, whether their parents are wealthy or not. All of these young men have the same course, all wear the uniform and each one has the full opportunity to gain the benefits. . . . The young men are not only of all social classes, they are also of all creeds.*—Secretary of War John W. Weeks.**

Caretaking

By Captain Robert N. Mackin, Jr., 14th Coast Artillery

A very large percentage of the Coast Artillery armament in the United States is in the hands of caretakers, either under local Ordnance Officers or small caretaking detachments.

An officer newly assigned to this work, whether coming from school, R. O. T. C., Organized Reserve, National Guard, foreign service, staff, or troop duty, naturally would seek a training manual or similar publication as a guide for the most efficient carrying on of the work. He will find that Section XI, T. R. 435-220, has some valuable information, principally prepared, however, for the care of armament "in service." Should the officer have recourse to the Ordnance Field Service Bulletins he will find some further information in Section III, O. F. S. B. No. 4. These latter instructions apply more particularly to the care of armament and equipment in arsenals and depots. Those paragraphs applying to materiel in the hands of the Coast Artillery are excellent and the result of long experience, but the caretaker must, to express it briefly, serve two masters. He must at the same time preserve the materiel from deterioration and also present the materiel to inspecting officers, some of whom, naturally, have had little Ordnance or Artillery experience, in an attractive condition as to *appearance*.

It is a very simple matter to take a few warm days in summer and daub an unsightly preparation of white lead over all bright and moving parts of the guns and carriages; gather all tools, slush them and pack them in their chests; pack all instruments away, etc., etc.; but, if it can be accomplished, how much better will it suit our ends to have all materiel in its proper place for service, ready for instant use, properly lubricated, and in a clean, bright, attractive condition?

With the latter happy condition as our objective let us now consider the means to accomplish that end.

General Policy

First it is imperative that a definite policy be adopted as to the condition in which we will maintain the armament "out of service" and just how we will dispose of the various instruments, tools, and similar materiel pertaining to that armament.

For caretaking purposes all materiel at Coast Artillery posts which is serviceable and not in the hands of troops should be considered as "in commission" "out of service." No materiel should be considered "inactive." No one can be certain just when any piece of materiel in our hands may be needed for use.

All armament and the accessories thereto should be kept ready for service at all times; all equipment for the service of each battery should be kept at

that battery; there should be no inter-battery borrowing of equipment; all materiel should be maintained clean, bright, and attractive in appearance, and displayed so as to facilitate inspection. Emplacements, galleries, magazines, parades, drains, approaches, and similar physical features of batteries should be maintained in a clean and attractive condition.

Methods of Caretaking

The following methods of taking care of the various types of materiel are suggested:

LUBRICANTS, CLEANING AND PRESERVING MATERIALS

Following are listed the principal lubricants and cleaning and preserving materials used in caretaking and brief descriptions of their uses:

1. *Cloth, crocus (commercial).* This cloth is used for cleaning and polishing finished surfaces such as breechblocks and brass work. Its use on fire-control instruments is forbidden.

2. *Cloth, emery, No. 00 (commercial).* This cloth is used for cleaning and removing rust from finished iron and steel surfaces. It is the coarsest abrasive permitted for work on breech mechanisms. Its use on soft metals such as brass, bronze, and babbit is prohibited.

3. *Cloth, emery, Nos. 0 and ½ (commercial).* These cloths are used in cleaning finished iron and steel surfaces where deterioration has occurred and for removing burrs and scratches.

4. *Cloth, emery, No. 1-Medium and No. 3-Coarse.* These cloths are used in removing rust, burrs, and other defects from unfinished surfaces of steel and iron.

5. *Compound, cleaning (sodium carbonate).* This cleaning compound is used in a solution for cleaning bores and breech mechanisms of small-arms and cannon and for removing grease and dirt from materiel preparatory to painting. To prepare the solution dissolve one-half pound of cleaning compound in one gallon of boiling water.

6. *Compound, rust preventative, grade A.* This oil, formerly called heavy slushing oil, is a semi-solid preparation used in the preservation of finished surfaces of iron and steel. In cold weather it is necessary to warm the compound before application.

7. *Compound, rust preventative, grade B.* This oil, formerly called light slushing oil, is a preparation similar to grade A, but is in liquid form and not nearly so heavy.

8. *Gasoline.* Gasoline is used for cleaning purposes only.

9. *Grease, lubricating cup, No. 5.* This grease is used in the compression grease cups and gear cases of heavy seacoast and railway materiel.

10. *Lime.* Lime is used in the preparation of a solution for removing paint from materiel. The solution is prepared by dissolving one pound of lye, powdered form, in six pints of hot water and adding enough lime to give the

solution the consistency of paint. The solution should be used freshly mixed and applied with a brush or waste tied to the end of a stick. When the solution begins to dry on the surface, use a scraper to remove the old paint. Complete the cleaning by washing thoroughly with a solution of cleaning compound (sodium carbonate) and water; this neutralizes the action of the lye and the lime.

11. *Lye, concentrated.* See paragraph 10.

12. *Oil, lubricating, class A-light.* This oil is commonly called engine oil.

13. *Oil, Neat's foot.* This oil is used in the preservation of leather equipment.

14. *Sandpaper (commercial).* Sandpaper is used on the surfaces of wooden parts of materiel. It should be applied with caution.

15. *Coat A.* This is a mixture of three parts compound, rust preventative, grade B, and one part oil, lubricating, class A-light. The oils should be mixed when warm, a temperature of 70°F. being sufficient. The coat is transparent and clean looking. It adheres to metal tenaciously when properly applied. The surface to be coated should be thoroughly clean, dry, and not cold. The coat is a splendid cover for all exposed finished metal surfaces of guns, their carriages, and similar materiel.

16. *Coat B.* This is a mixture of three parts of compound, rust preventative, grade B, and one part compound, rust preventative, grade A. The coat should be mixed and applied as prescribed for Coat A, and is used on the finished surfaces of the materiel to replace Coat A, when the latter is not found sufficiently heavy.

Other material. In addition to the above mentioned materials there are, of course, paints, varnish, brushes, burlap, and many other articles used in caretaking, but their uses are clearly defined and well understood by the average Coast Artilleryman.

GUN CARRIAGES

Except as noted hereinafter, all bearing and other finished surfaces should be cleaned with gasoline, permitted to dry thoroughly, and covered with an application of Coat A. This application will furnish ample lubrication and preservation for those parts of the materiel between April and September. It is believed that this coat would furnish ample protection the year round on the West Coast, in the Gulf States, and on the East Coast south of the 40th parallel of latitude.

Where a heavier coat is found necessary, Coat A should be removed with waste and a good application of Coat B applied. A warm day in the fall should be selected for this work.

Those parts which function from time to time in elevating, traversing, and tripping should, of course, be recoated each time they are used. All brass and German silver scales should first be polished with metal polish and then coated with oil, lubricating, class A-light. This prevents oxidation and keeps the

parts bright and clean permanently. All brass handles and similar parts of the carriage should be kept clean and dry, but not polished.

Recoil cylinders should be cleaned at least once each year, preferably under the supervision of an Ordnance machinist. The cylinder head and piston rod should be removed, the interior of the cylinder cleaned with gasoline, and when dry, coated with compound, rust preventative, grade A. The oil level in the cylinders should always be maintained even with the filling holes. Kick-down and buffer cylinders should be kept filled with hydrolene at all times.

The oil cylinders of the 3-inch antiaircraft materiel, Models 1917 and 1918, should be drained, cleaned, and refilled annually, as prescribed in the particular gun handbooks, Ordnance pamphlets 1808 and 2018, except that gasoline should be used for flushing instead of coal oil, as prescribed.

The replenishers of the 155-mm. G. P. F. materiel should be exercised once each four months by draining and refilling. Caretakers should not disassemble the 155-mm. recoil and recuperator mechanisms. Such work is a function of the Ordnance Department.

All traversing rollers and paths should be cleaned and coated with compound, rust preventative, grade A, once every six months if practicable, and certainly once each year.

All compression grease cups on guns and carriages should be filled with grease, lubricating cup, No. 5, and the caps screwed down whenever necessary, so as to maintain the pressure of the spring upon the grease. The normal position of the spring rod is about $\frac{1}{4}$-inch above the top of the cap. The grease cups on heavy-duty open bearings, such as the trunnions of major-caliber guns, should be filled with graphite grease.

Oil holes should be kept free from dirt, a heavy wire being found valuable in this work. A generous supply of oil should be inserted before each inspection.

In applying lubricants, all moving components will be maneuvered to insure that the lubricants reach all bearing surfaces.

Care should be taken that magnetoes, switches, insulated covering of wires, commutators, and other electrical apparatus are kept free from all oil and grease.

Carriages should be traversed between limits in the presence of the inspecting officer at each inspection and brought to a rest at an azimuth different from that at which traversing was commenced.

Elevating mechanisms should be operated between stops at each inspection.

Disappearing carriages should be tripped at the last inspection of each month during the year.

Barbette carriages should be brought to full recoil at least once each year, the exposed parts examined and cared for, and the carriages released.

All motors installed on gun carriages should be operated at each inspection by a commissioned officer.

All gun carriages should normally remain with their guns at an elevation of 5 degrees plus: barbette carriages in the "in battery" position; disappearing carriages in the "from battery" position.

MORTAR CARRIAGES

The instructions given in the preceeding paragraphs for the lubrication and care of gun carriages should be followed where they apply to mortar carriages. Once every two years mortars should be dismounted and the carriages cleaned, overhauled, and repainted. This work should be performed under the direction of an Ordnance machinist.

All mortars, except the Model 1918, which should be elevated about 5 degrees, should remain elevated with their axes parallel to the piston rods.

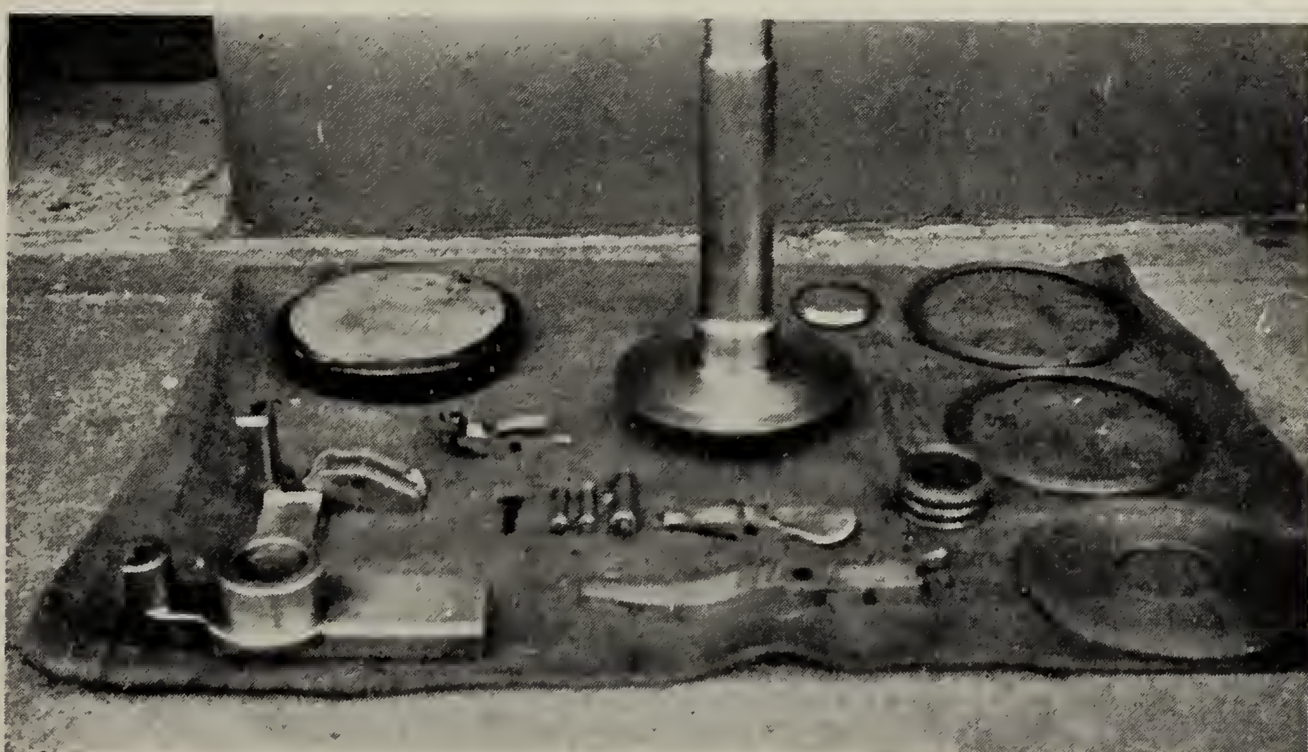

FIG. 1. SAMPLE DISPLAY OF THE DISMANTLED PARTS OF THE BREECHBLOCK

ALL CARRIAGES

The oil or grease which has overflowed from oil holes, filling holes, or grease cups should not be permitted to mar the appearance of carriages but should be removed with gasoline and clean waste.

GUNS AND MORTARS

In the spring and fall, all oil should be removed from the chambers and bores of all guns and mortars, the bores cleaned dry under considerable pressure and then thoroughly recoated with compound, rust preventative, grade A. This coat should not be applied when the bore is cold nor should the coat be very heavy. A light coat properly applied is much more efficient as a preservative than a heavy coat and presents a much finer appearance.

Caretaking detachments rarely have sufficient personnel properly to man the bore sponge on large guns or mortars. Excellent results can be obtained by the use of a pull-through, *i. e.*, a rope passed through the bore and attached at the breech-end to an improvised sponge head. Sufficient burlap is wrapped

around the head to obtain the desired pressure and the head is drawn through the bore from the muzzle. The motive power may either be a truck, tractor, capstan, or tackle. In this way three men can thoroughly clean and oil the bores of the largest guns.

All breechblocks, except those on antiaircraft guns and 3-inch seacoast guns, should be dismantled, and in each case the mushroom head, split rings, filling-in disc, and spindle nut should be oiled with Coat A and neatly laid out on a clean rectangular piece of folded burlap in front of the gun tool-board, with no parts touching.

Particular care must be paid to the vent, which should be thoroughly cleaned and coated with oil, lubricating, class A-light. Officers should examine the vent at each inspection by tilting the spindle so as to permit the light to penetrate the vent. The vent is an extremely important part of cannon and should be so treated.

The bearing parts of the breech mechanism are lubricated with oil, lubricating, class A-light. A mixture of No. 5 cup grease and flake graphite, four-to-one, should be used on translating rollers.

The gas-check pad should be placed in its regular container, hermetically sealed, and placed in a horizontal position on the burlap. The breechblocks should be dismounted from the 3-inch seacoast and antiaircraft guns, oiled with Coat A, and the parts neatly displayed on a square piece of folded burlap in front of the gun tool-board.

All bright parts of the breech face, breechblock, and operating mechanism should be oiled with Coat A. A sufficiently large piece of waste, saturated with Coat A, should be placed as a tight plug in the spindle recess.

All breech covers should be removed from guns and mortars, except the 3-inch seacoast and antiaircraft guns, thoroughly washed and cleaned with gasoline, neatly folded, and placed in clean, dry storage in the battery tool rooms.

The safety lanyard devices on guns mounted on disappearing carriages should be exercised at each inspection by a commissioned officer.

The operating handles and translating rollers of breechblocks, after being oiled with Coat A, should be stored openly on suitable, neat holders in the battery tool rooms, except when they are actually in use.

Firing mechanisms should be oiled with Coat A and placed in the boxes provided. These boxes should be kept on a shelf in the battery tool room with the lid open so as to permit inspection at a glance. The parts of the mechanism being small, it has not been found satisfactory to display them individually.

Except in the case of 3-inch seacoast and antiaircraft guns, the breech mechanisms of all guns and mortars should be operated at each inspection by a commissioned officer.

SUBCALIBER GUNS

Each subcaliber gun for armament above 3-inch in caliber should be displayed in a battery store-room on a carrier, such as a shot truck, to permit

examination of the bore at a glance. (See Fig. 2.) The bores of these guns should be cared for in the manner prescribed for the bores of large guns and mortars.

A simple elevated rack should be constructed for the display of cal. .30 subcaliber cartridges, the bores of which should be cleaned in the manner prescribed for rifles.

All tools pertaining to subcaliber guns should remain in the chests provided for them, but chests should remain open at all times.

All bright and bearing surfaces of subcaliber guns and their accessories should be oiled with a light application of Coat A.

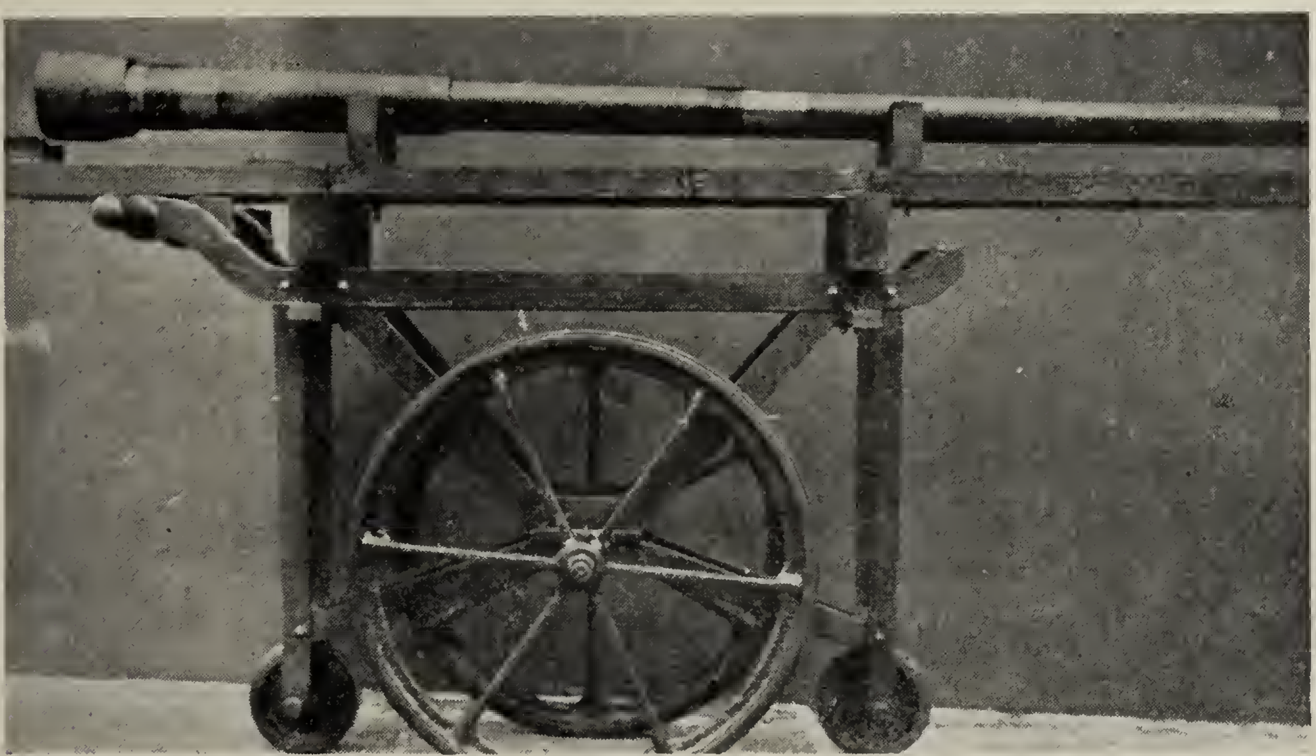

Fig. 2. One-pounder (1.457-inch) Subcaliber Tube Mounted on Improvised Carrier to Facilitate Inspection

PAINTING OF GUNS, MORTARS, AND THEIR CARRIAGES

The instructions given for painting this materiel in T. R. 435-220 are excellent and need little elaboration.

Paragraph 43 (*b*) (8), states: "When paint becomes so thick as to scale off in places or to give an unsightly appearance . . . it should be removed for repainting." That is certainly a sensible statement. Removing the old paint from a large gun or carriage is a major operation for small detachments.

There are two purposes in painting materiel, viz., preservation and appearance. In caretaking it is believed that these two purposes are best served when the painted surface presents a clean, clear, unstained appearance and the wood or metal underneath is protected from deterioration. At some posts a good application of paint will last many years and the frequency with which materiel is to be painted is a matter of local decision.

The red paint specified for grease cups, oil plugs, name and direction plates should be red *paint* and *not* red lead. Vermillion contrasts splendidly with the standard olive drab paint.

Paint-spraying machines are not considered a success in painting armament. There are so many gears, bearing surfaces, operating parts, and points of

lubrication that hand work with a brush has been found to consume less time than using a spray with the resultant cleaning up of parts not desired to be painted.

COVERS FOR MATERIEL

The disposition of breech covers has already been mentioned. Regarding that practice and the disposition of breech covers for other parts of guns and carriages, the thought is advanced that possibly breech covers, piston-rod covers, and all the many, various, standard and improvised covers of canvas, wood, and tin are not a complete success in caretaking. Muzzle covers are a necessity, as there is no drain hole in the breech of a gun.

Where a cover is suspended above and not touching a lubricated surface, there is, undoubtedly, additional protection from rain and hail, but not from flying sand and snow. However, most covers, breech covers in particular, do touch some parts of the finished surfaces. The result is that the oil is rubbed off and rust ensues; then, in time, pitting. Some canvas covers also cause condensation. It is held that we are supplied excellent preservatives which, if properly applied, will protect any finished surface against the elements.

Further, covers require labor for their removal and tend to make materiel unsightly in addition to interfering with facility in inspection.

It is not recommended that all covers be dispensed with, irrespective of climatic conditions, but these ideas are submitted for consideration. They have worked very well in two defenses.

TOOLS AND TOOL ROOMS

The improvised tool-boards found almost universally in coast artillery batteries can hardly be excelled as a means of displaying, checking, and caring for the standard tools of those batteries. To be most effective, however, the spaces on the boards should be altered when permanent changes are made in the tools of the battery.

Similar boards should be made for armament added to the Coast Artillery in the last ten years and now on permanent assignment. In the absence of tool-boards, the tools can be displayed on neat squares of burlap placed on the floor adjacent to the armament in the latter's place of storage. Good results have been obtained with 155-mm. and 3-inch antiaircraft equipment by arranging the various tool chests in the form of the letter *U*, with the covers opening outward and the tools displayed on burlap in the center of the *U*.

All chests should be elevated on skids, kept open, and, whenever at all possible, empty, the contents being displayed in the same room with each individual article exposed.

Sight cases should be kept on shelves, with the covers closed but not secured.

A separate, painted rack or board should be made for the Quartermaster property in batteries, such as brooms, shovels, saws, and nail-pullers.

All finished surfaces of tools and the entire surfaces of files should be oiled with a light application of Coat A. The grips and handles (wood and steel) should be painted a convenient color. Olive drab is suggested; black is satisfactory.

The staves of rammers, bore and chamber sponges, brushes, and scrapers should be painted olive drab. Sponge heads should be kept clean and stripped of old, used burlap.

Should there be sufficient obsolete projectile or gun paint on hand, as is really the case in many forts, the normal oil-stained and often unsightly floors of tool rooms can be enormously improved by the application of a coat of such paint.

A well-kept tool room can be made a thing of beauty in the eyes of an artilleryman. In caretaking there are but few tools in constant use and there is little need for disturbing the appearance of tool rooms. Should the armament be used by other components of the army for a few weeks in the summer, it will be found that our civilian friends are delighted to find such conditions prevailing and eager to help maintain them so.

OIL ROOMS

Oil rooms should contain only cleaning and preserving materials and their receptacles. Oil cans and paint cans should be segregated on shelves and plainly labeled to denote their contents. All unsightly and useless containers should be disposed of. Caretakers should make a practice of using small, handily carried oil and paint containers when working about the armament, refilling the containers as is necessary from the original containers on shelves. Oil brushes may be kept in the small oil containers, but a small rack should be improvised to hold all paint brushes immersed in water. The lower part of a five-gallon oil can, cut about six inches from the bottom, boxed, with two uprights supporting a horizontal board containing a row of wire nails makes a good rack. The brush handles are, of course, bored at the proper place, so that the brush proper is completely immersed in water when the handle is hung upon the nail.

Burlap should be kept on a roller or reel, supported about two feet from the floor.

Only clean waste should be kept in the oil rooms. Used, serviceable waste should be kept in a container outside of the oil room, where there is no danger from possible combustion. Surplus, small, corrugated powder cans make excellent containers for waste.

Sand boxes placed under oil and paint shelves help considerably in keeping the rooms neat and clean.

No supplies should be placed on the floor. Such articles as lye, soap, scrub brushes, etc., should be neatly arranged on the shelving.

All shelves, waste containers, oil reservoirs, and racks should be painted, preferably olive drab, but the important consideration is that they be painted. Floors should be painted as outlined for tool rooms.

PLOTTING ROOMS

All smooth, finished metal surfaces of position-finding apparatus should be polished and these surfaces, with all sand-blasted surfaces of the apparatus, should be coated with a light application of oil, lubricating, class A-light.

Gun-arm center boxes should be kept open and empty, the targ, rulers, tools, and spare parts being neatly displayed on the plotting board. The canvas cover of the board should be clean (washed, if soiled), folded to a one-foot square, and placed beside the tools. When observing instruments are stored in plotting rooms they should be mounted on their tripods; the instrument cases beneath the tripods, opened.

All old data recording sheets, used plotting paper, obsolete data, and similar refuse should be cleared out under the supervision of an officer.

All apparatus should be in adjustment and oriented, with orientation data clearly displayed. The charts for range, deflection, and other boards should be of the latest approved type for the particular armament.

Worn out, unsightly rubber floor matting should be replaced.

OBSERVING STATIONS

All instruments should be kept on their proper mounts, oriented, lubricated, and covered, where standard covers are provided, for protection from dust. All instrument cases should be open and empty, except for the extra eye-pieces and spider-line cells, which should be kept in their pockets. Tools should be displayed on the tool rolls in front of their respective cases. Correct orientation data should be clearly displayed. All extraneous papers should be disposed of as mentioned for plotting rooms.

TELEPHONES

Present Signal Corps regulations require all telephone headsets, except those in reserve, to be connected and in place ready for use. In one harbor defense, however, approval was given to the practice of keeping headsets for telephones in uncovered emergency stations, gun platforms, etc., in the battery plotting rooms. It is believed this practice greatly assists in prolonging the life of this materiel.

Good caretaking cannot countenance broken mouthpieces, broken cords or wires, nor rubber ear-caps in a state of deterioration. The local Artillery Engineer will gladly place this materiel in good condition.

LEATHER EQUIPMENT

There is considerable leather in the hands of caretakers—instrument cases, carrying straps, gunners' pouches, covers, and several other articles. Very few materials deteriorate as quickly, or appear so unsightly, as moldy leather. Cleaning leather which has been saturated with mineral oils, as is often the case with gunners' pouches, presents a difficult problem. It is recommended

that such leather, and all other soiled leather, first be washed in clean, warm water, using a good, heavy lather of saddle soap applied with a clean sponge. After washing the leather, it should be rinsed well in water to remove all soap, and permitted to dry in a natural way, not by artificial heat nor the direct rays of the sun. When it is nearly dry a coating of neat's-foot oil should be applied, the oil being rubbed in thoroughly. Excess oil should be wiped off with a soft rag. It is hardly possible to restore the original light color to the leather or to remove the stains, but this treatment will stop deterioration and preserve the leather indefinitely. All leather equipment should be coated with neat's-foot oil in a similar manner.

POWDER AND PROJECTILE MAGAZINES

The instructions published in regulations for the care and storage of explosives are clear and definite. The following notes, however, may be of some assistance.

In all cases, explosive containers should be placed on skids above the floor, with skids between tiers and at least one inch of space between containers laterally. When restacking containers, neatness and uniformity should be the watchword. The part of the container bearing the description of contents should be placed in such a position that the description may be read without moving the container.

Good results have been obtained by stacking all single-section powder cans horizontally, tops toward the aisles. When stacked this way vertical supports should be placed between each tier. Powder containers should be painted black, with the description of contents stencilled in white.

Projectiles should be painted as prescribed in O. P. 2036, but should there be any delay in painting, their surfaces should be protected with a light application of Coat A.

In some magazines there is considerable precipitation of lime from ceilings. Strips of burlap or similar material suspended over powder containers and projectiles will afford good protection to the material, but the covering should not rest on the cans or projectiles, as that practice interfers with inspection and actually increases deterioration.

Dummy projectiles should not be painted but oiled with a light application of Coat A. These projectiles should not be kept on shot hoists or serving trays but neatly stacked by themselves on skids in a magazine beneath a trolley. Dunnage for the storage of ammunition is supplied by the Engineer Department upon requisition—Authority: par. 21 *a* 3, O. F. S. B. No. 2, Section I.

HOISTS

All hoists should be kept well painted and lubricated, the brass parts should be polished, and covered with a light application of Coat A. When electric current is available each hoist should be operated at the approach of a commissioned officer on inspection. Should current not be available the hoists should be operated by hand.

AMMUNITION TRUCKS

All ammunition trucks should be painted when the guns and carriages are painted and in a similar manner. Six-inch shot trucks should be stored inverted with the trays on skids. Trucks for larger caliber guns should be raised on skids with the wheels free from the floor. Oil holes and bearing surfaces should be cared for as prescribed for gun carriages. Buffer cylinders should be kept filled with hydrolene at all times. Except for inspection, the rooms in which shot trucks with rubber wheels are stored, should be kept as dark as possible for the preservation of the rubber. One member of the caretaking personnel at each post should be specialized in the replacement of worn-out rubber tires with rope tires.

DOORS, RAILS AND RAILINGS, TROLLEYS AND CHAIN BLOCKS

This equipment of batteries is normally kept painted by the Engineer Department but its lubrication is the responsibility of caretakers. All bright parts should be covered with an application of Coat A, particularly the chain blocks. A few drops of oil, lubricating, class A-light, should be inserted monthly in the mechanism of door locks.

BATTERY EXTERIORS

If only on the basis that first impressions are important, the approaches and exteriors of batteries should present a neat, clean, cared-for appearance. Gravel roads should be raked and, if possible, cleared of weeds and grass; there should be but two receptacles in front of the battery: a can for soiled waste and a can for rubbish. Oil-strained concrete can be cleaned with a lye solution. Grass and brush which obstruct the vision from gunpointers' platforms or B. C. stations should be removed by cutting or careful burning. Grass should not be permitted to become a fire hazard and, while it is not expected that grass-covered areas adjacent to the battery should present the appearance of a city lawn, it is often possible to secure a horse-drawn mower, or, as a last resort, careful burning can be employed.

MATERIEL UNDER COVER

Materiel stored under good cover, such as 155-mm. guns, mobile antiaircraft guns, mobile searchlights, tractors, and motor vehicles, should present no problem to the caretaker. Once placed in the condition outlined in the fixed armament paragraphs, but little care is required to maintain it in that condition. A certain date each month should be specified on which all motors will be operated for ten minutes. Lighter, more transparent oils which enhance appearance may be used on materiel under good cover.

The practice of removing and displaying tools from tool chests should be carried out whenever at all possible in the care of this type of material. This is not practicable in the case of Artillery repair trucks and similar vehicles,

but the tools in the various drawers should be kept oiled and painted as described in the paragraph "Tools and Tool Rooms." The care of motor vehicles is fully described in the handbook for each type and need not be discussed herein.

STOREHOUSES

The principles enumerated through-out this article should be followed in the care of storehouses. All packages should be neatly stacked off the floor and clearly marked as to contents. All tools should be oiled as described herein and neatly piled. All articles pertaining to a particular armament, vehicle, department, or activity should be grouped, with shelves or receptacles plainly labeled to show their contents. Everything should be so displayed as to facilitate issue, inventory, and inspection.

The floors of oil and paint storehouses should be covered with an inch of clean, dry sand or sawdust.

EMPLACEMENT BOOKS AND PROPERTY RECORDS

All gun and emplacement books should be collected and neatly filed in the office of the local Ordnance Officer who should keep the books up to date in accordance with the instructions contained in A. R. 90-80. It has been found labor-saving and convenient to keep a tickler recording each event requiring notation and to make these entries in all books affected on the first day of each quarter.

In each B. C. station there should be a clip board holding an original memorandum receipt listing every item of stock record equipment in the battery, less the cleaning and preserving materials. This receipt should be the basis of check for special and annual inventories. A copy of the receipt is kept in the stock record office. When the battery is placed "in service," the original receipt is signed by the officer taking command and filed in the stock record office. He is furnished the duplicate copy. When the battery is turned back, the receipts change hands. Obviously, when changes are made in the equipment of a battery, the memorandum receipt must be changed accordingly, but changes should be kept to an absolute minimum. Property damaged or worn out should immediately be replaced in kind.

INSPECTIONS

Here we have the only certain insurance of good caretaking—*intelligent, frequent, and careful inspections* by the officer charged with caretaking or by his commissioned assistants. This work should not be delegated to enlisted men.

Once each year it will be necessary to make up a schedule in each defense, showing definite periods when the important operations in the work specifically called for by regulations, will be carried out. For example:

Fourth week in April—Change to Coat A.

First week in May—Clean recoil cylinders.

Second week in May and October—Clean traversing rollers and paths.

Third week in May—Exercise all barbette carriages.

Third week in March, June, September, and December—Exercise 155-mm. replenishers.

Fourth week in May and October—Clean bores.

Month of June—Overhaul mortars.

Fourth week in September—Change to Coat B.

The schedule should be as brief as possible and made after consideration of the climate in each defense. One copy of the schedule is sent to each fort caretaker only. Private John Caretaker, of Battery *X*, should receive no written communications. The writer has no faith whatever in the issuing to enlisted caretakers of voluminous work sheets.

There is only one sure way for the responsible officer to determine whether the materiel is properly cared for and that is by personal inspection. If physically possible, each battery under caretaking should be inspected at least once each week, every week in the year. Fridays are good days for inspections. Haphazard inspections disgust the men and do harm. The inspections should be regular and well-planned. For example: While all activities should be visited at each inspection, during the first week's inspection of each month a thorough inspection should be made of the armament proper; the second week, magazines and store-rooms; the third week, B. C. stations, plotting rooms, and observing stations; the fourth week, power plants and storehouses. Each inspector should equip himself with a reminder list for each of these groups, each list naming briefly each part of the materiel or property in the group which should be examined in a thorough inspection. Obviously, these various lists cannot be included in this article nor need they be. Any interested Coast Artillery officer can make up complete lists with a little study of the materiel. The lists should be typewritten on paper, and the paper pasted on good, stiff cardboard of a size to fit the upper pockets of the uniform blouse. Only those lists need be carried which pertain to the group under thorough inspection.

This type of inspecting is hard, grinding work but it certainly has its rewards. Commanding officers can often help tremendously by being favorably inclined toward granting requests from the caretaking officer for commissioned assistants.

Regularity is a virture in caretaking.

Inspectors should make pencilled notes of defects found and indicate the defects to the caretakers. On the next inspection, the notes should be referred to in order to ascertain whether the defects have been remedied.

GENERAL

None of the ideas presented herein are untried theory, but have been and are being carried out in practice and are giving good results.

Once a battery has been placed in the condition outlined herein, it is a very simple matter to keep it in that condition; in fact, one good soldier working

thirty-six hours per week can properly care for two major-caliber batteries after a working detail has placed them in condition.

Caretakers take great pride in a good-looking battery and a spirit of good-natured rivalry should be encouraged. A word of commendation from senior officers works wonders. If a battery is skipped during the inspection of a visiting ranking officer, the officer in charge of caretaking should immediately secure the highest ranking resident officer in sight and have him complete the inspection with full formality. Without nursing the men, officers should work toward improving the morale of the caretakers by bettering the condition of quarters and living conditions, encouraging farming and the keeping of live stock where practicable, improving messes, and, last but not least, installing a radio at each isolated post.

To place a battery or other installation in condition, or to clean up after a severe winter or heavy storms, it may be found necessary to combine all caretakers in one detail, augmented, possibly, by personnel from a garrisoned post. Such a detail will very likely accomplish more and better results under the direct supervision of a commissioned officer.

Some installations normally found at Coast Artillery posts, such as barracks, quarters, and shops, have not been mentioned herein. The armament and the equipment for serving it are our particular care, but, in the caretaking of the installations not mentioned, the ideas presented herein should be of some assistance.

***The true value of military training is that it establishes intimate association, acquaintance and comradeship amongst boys of every class and grade of our people, and makes the rich and the poor, the rural and the urban, the native and the foreign know and understand each other as nothing else will.*—R. S. Lovett, Chairman, Executive Committee, Union Pacific Railroad.**

The Care of Seacoast Armament and Its Relation to the Mission of the Coast Artillery Corps

By LIEUT. EDWARD BARBER, C. A. C.

THE importance of the proper care and preservation of the large amount of seacoast armament "out of service" has, in the past, been either underestimated or entirely overlooked. The scramble for high scores in target practice and the endeavor to develop and maintain model organizations have undoubtedly required the major portion of every commander's attention. The recent inspection reports of technical personnel of the Signal Corps and Ordnance Department have been viewed by the War Department with considerable alarm, as they have indicated that Coast Artillery equipment has not been maintained in the desired condition. A re-statement of War Department policy relating to this equipment has resulted, and is expressed in no uncertain terms.

Before considering this policy, the present situation of the Corps, with respect to the care of its armament, should be examined. Consider, as a typical example, an average Coast Artillery District within the territorial limits of the United States. The one under consideration has four "active" and two "inactive" harbor defenses representing a total of twenty-six different forts. There are about eighty-five seacoast batteries of all calibers "in commission," or about two hundred guns, with all accessories, fire-control communications, command and observing stations, and ammunition. Of course, in addition, there are within each harbor defense barracks, quarters, storehouses, varying amounts of water transportation, and a certain number of mobile guns that are not in use and require maintenance.

The geographical location of these installations has a decided effect upon the situation. To the average observer, it seems that the primary consideration in siting seacoast armament has been to select a convenient island or narrow strip of mainland, readily accessible by means of water transportation only, and then proceed with the construction of batteries and various other installations required for the complete military village. With no desire to discuss the merit of the present siting of armament, the fact that the Corps must resort to the use of boats in order to care for about ninety per cent of its installed armament is deplorable. This is quite a factor, especially since harbor boat transportation has become a large-sized target for the economy experts to shoot at. This is quite justified when it is considered that the money spent annually in operating one harbor boat will feed, clothe, and pay about fifty soldiers for the same period of time.

In regard to troops, there are twelve "active" Regular Army Coast Artillery Batteries in the District, two of which are skeletonized and assigned to "inactive"

harbor defenses and one other assigned solely to special development work. The average authorized strength is seventy men each, the actual strength being somewhat below this number. Seven batteries have primary assignments to guns of the various calibers, but due to their small strength are unable to man all elements to which assigned. A list of the various activities that these troops are required to carry on is most impressive. Among the more important are:

1. Conduct of small-arms target practice.
2. Maintaining highest standards of appearance.
3. Maintaining proficiency in individual military subjects.
4. Maintaining trained manning details for elements to which assigned.
5. Maintaining proficiency in drills and ceremonies.
6. Furnishing labor required for the majority of ordinary post maintenance.
7. Care of armament and barracks to which assigned.
8. Conduct of Coast Artillery target practice.

Recent regulations relating to annual target practice have imposed requirements that are sometimes difficult to meet. In the endeavor to man and fire two guns per battery, there has been at least one instance of combining the personnel of two organizations so as to fire a gun practice in the morning and a mortar practice in the afternoon. Coast Artillery Memorandum No. 8, 1928, lists one organization as conducting a 3-inch antiaircraft gun practice on June 3 and a submarine mine practice on June 30. In a good many instances, even Headquarters Batteries, normally considered special-duty regimental organizations, have been required to conduct major target practices. Officers who have served with troops under present conditions do not wonder that the only time the average soldier has to polish his own equipment is at night, a time presumably reserved for recreation and rest.

Last, but not least, is the care and preservation of "out of service" installations. Assuming that the eight hundred enlisted men of all grades, present in the typical district, are all available for caretaking, there are about two men available for each of the two hundred seacoast guns installed, after deducting those necessary for care of other installations. In other words, every two men, in addition to being armed with rifles or pistols, are also armed with a seacoast gun which requires considerable care and attention. In no other branch do the same conditions prevail. The excess equipment has invariably been disposed of by sale or transferred to a supply branch for storage. However, there is no one supply branch of sufficient strength to take over the preservation of installed seacoast armament and its various accessories. The fact must be accepted that the Coast Artillery Corps must care for its "out of service" installations with little outside assistance.

There is a belief prevalent in certain quarters that fixed seacoast armament is a thing of the past and that our harbor defenses should be abandoned. This belief is no doubt inspired by an observation of present day "big" business methods. When large corporations reach the conclusion that certain of their elements are behind the times, they do not moan over the money that has been

put into these elements. At one "fell swoop" they usually eliminate the older things and replace them with newer and more efficient things, carrying out the old adage—"Off with the old, on with the new"—without quibbling. They have evidently found this procedure to be a distinct advantage, resulting in economy and greater return on investments. It is well known that in New York City buildings costing several millions of dollars are, after less than ten years of service, being replaced with bigger and better structures at a surprisingly rapid rate.

However, in spite of the fact that the development of heavy mobile artillery has practically ended any further installation of fixed armament, our present harbor defenses have considerable value. They protect important localities and are strong points along our coast line which should help to restrict the operations of a hostile expedition to unfortified and, in the main, unfavorable localities. History tells us that almost every encounter between ship and shore has resulted somewhat disastrously for the ship. The Dardanelles campaign is a recent example often referred to. It is noteworthy that during the Joint Army and Navy Exercises at Narragansett Bay in 1927, the hostile battle fleet remained well outside the limit of gun fire of the harbor defenses. The batteries cannot be dismantled nor can the harbor defenses be abandoned, if for no other reason than the fact that a sufficient quantity of suitable mobile armament does not exist. Further, there exists an obligation to the taxpayers, whose money paid for the construction of these batteries, to keep them in the best condition possible, so they may serve the purpose for which they were installed. A gun installed is serving its purpose if it is capable of being fired when needed.

Having indicated briefly that the large amount of "out of service" installations must be maintained by the Coast Artillery Corps, a study of some of the methods now employed in accomplishing this work is in order. The care of armament and equipment has quite properly been made a responsibility of the harbor-defense commander. This, of course, gives rise to the employment of various and widely divergent methods. Present regulations prescribe that Fort Ordnance Officers are responsible for the property pertaining to batteries "out of service" and Fort Artillery Engineers are responsible for the condition of fire-control communications, power plants, and searchlights. One of the missions of a Headquarters Battery (HD) is to provide personnel for the maintenance and administration of forts on a caretaking basis. The 1914 edition of Coast Artillery Drill Regulations contains a brief section devoted to "Caretaker Detachments," parts of which are quoted herewith.

> The care and preservation of all ordnance property will be in the charge of an ordnance sergeant when practicable.
>
> The care and preservation of all engineer and signal property will be in the charge of an electrician sergeant when practicable.
>
> The general protection . . . will be in the charge of a non-commissioned officer of Coast Artillery, who will also be in command of a detachment of privates of Coast Artillery detailed to assist the ordnance sergeant . . . .

> The composition of Coast Artillery detachments . . . will be determined on the following basis: one private to every two guns of five-inch or greater caliber; one private to every two mortars; one private to each rapid-fire battery of four guns or less below five-inch in caliber; *provided*, that in no case . . . less than one noncommissioned officer and three privates.

The foregoing regulations undoubtedly form the basis for the system most used in our "active" harbor defenses in the United States at present. It contemplates the detail on special duty of from four to sixteen or twenty enlisted men from the headquarters battery, depending upon the amount of armament. These are usually divided into Ordnance details and Artillery Engineer details, each particular staff officer concerned being responsible for the property pertaining to his branch.

Under present conditions, this is unsatisfactory. It necessitates dual responsibility, makes the caretakers subject to the orders of several different officers, each of whom is quite humanly prone to give his own activity priority. It burdens several Harbor Defense Staff Officers with frequent visits of inspection (since there are usually no Fort Staff Officers). It does not provide for a systematic care of Quartermaster installations, nor does it secure concerted and coordinated effort in maintaining the other installations. Probably the worst feature is the violation of the principle of economy of force. In time of peace, with the Coast Artillery Corps at such reduced strength, it is paramount that our small organizations have available for active duty and training, under their battery officers and noncommissioned officers, the maximum number of men. The dissipation of energies on activities such as caretaking, which in no way contribute toward building up a well-trained, well-disciplined, efficient force of fighting men, should be reduced to the absolute minimum. The more we reduce the number of men on special duty, the more we are strengthening our combat organizations.

A system which has produced very good results in maintaining "out of service" armament has been observed in some of the foreign-service garrisons. Each organization has been given two or three assignments to armament; one, a primary for target practice, and the others, secondary, for maintenance, thus making each battery commander, under supervision of the battalion commander, responsible for care of a portion of the "out of service" armament. The success of such a system depends mainly on a close grouping (geographically) of assignments or an adequate harbor boat service and a personnel strength of almost fifty per cent of that required for manning the harbor defenses at war strength. Its employment within the United States would, of course, be out of the question, due to the reduced strength, the large number of island forts, and the greatly curtailed harbor boat service.

In a letter dated July 26, 1928, the War Department prescribes the "Policy as to Coast Artillery Equipment," extracts of which are quoted.

> 2. Certain forts and harbor defenses have, of necessity, been placed on a caretaking status due to the present reduced strength of the Coast Artillery Corps, but these fortifications are not (except as announced by the War Department) to be con-

sidered as subject to probable abandonment, and every effort will be made to maintain them in such condition as to insure full operation without delay in case of threatened emergency. A caretaking detachment of Coast Artillery personnel has been assigned to each inactive harbor defense for the purpose of keeping the entire equipment, as installed, serviceable and intact. While the batteries pertaining to inactive fortifications are out of service (Pars. 41 and 43, T. R. 435-220), the harbor defense commander concerned will make such regular inspections as will insure the keeping of all equipment of the seacoast and mobile armament assigned to his command in condition for prompt restoration to an active status.

3. Fire-control equipment will not be removed, *either temporarily or permanently*, from assigned stations for *any purpose*. Corps area and department commanders are authorized to make specific exceptions to this general policy, in cases *of inactive harbor defenses only*, where climatic conditions or locations are such as to require the removal of such equipment for storage in order to prevent serious deterioration or theft. Whenever such action is taken under this authority, a report of the case will be made to the War Department in order that the actual situation may be of record. All fire-control equipment removed for storage under the authority indicated above will be reinstalled in operating condition in its assigned location once each year for technical inspection at such time as may be designated by the corps area or department commander unless such reinstallation is waived in a specific case by the War Department as a result of exceptional conditions.

This policy is clear and, in a measure, drastic. In order to present a closer view of the result of a strict interpretation of this policy, a partial list of the routine caretaking requirements, gleaned from existing regulations, is presented.

Breechblocks for batteries in service should be dismantled twice a year and before target practice and once a year for batteries out of service. (Par. 43 *b* (13) (c), TR 435-220.)

In general, three coats of paint should be given guns and mortars the first year they are mounted; thereafter one or two coats annually will suffice the actual needs, depending upon the climate and local conditions. (Par. 43 *b* (5) (a), TR 435-220.) The number of coats of paint required for carriages is the same as that for guns and mortars. (Par. 43 *b* (6) (a), TR 435-220.)

Guns should be tripped, elevated, depressed, and traversed between limits once a week. Barbette guns, except those mountd on 12-inch M1917 and all 16-inch, should be withdrawn to normal recoil every three months. (Par. 43 *b* (10), TR 435-220.)

Breech mechanisms should be operated once a week. (Par. 43 *b* (16) (a), TR 435-220.)

Mortars should be retracted and released several times prior to service target practice. (Par. 29 *c* (4), TR 435-220.)

Electric motors should be operated weekly. (Par. 43 *b* (11) (f), TR 435-220.)

Recoil cylinders should be cleaned twice a year. (Par. 43 *b* (12), TR 435-220.)

Mortars should be dismounted every two years. (Par. 43 *b* (11) (i), TR 435-220.)

Open drains and gutters should be swept weekly. (Par. 43 *a* (2), TR 435-220.)

Water fixtures should be inspected weekly. (Par. 43 *a* (3), TR 435-220.)

All light and power equipment should be operated once a month. (Par. 43 *a* (9), TR 435-220.)

Ammunition service apparatus should be operated once a week. (Par. 43 *a* (10), TR 435-220.)

Storage places for powder and explosives should be inspected monthly. (Par. 44 *a* (1), TR 435-220.)

Temperatures in powder magazines recorded daily during periods of excessive heat. (Par. 44 *a* (12), TR 435-220.)

Cases containing smokeless powder should be tested annually to determine efficacy of hermetic seal. (Par. 2 *c* (3), OFSB No. 3 C 7.)

Test sample bottles of each lot of powder observed daily and fresh strip of paper should be inserted every month. Fresh samples of powder should be taken every six months and once a year for fixed ammunition. (Par. 44 *f*, TR 435-220.)

Monthly tests of fire-control communications should be made. (Chapter XII, SCM No. 8.)

All gasoline and oil engines should be operated once a month. (Par. 43 *a* (9), TR 435-220.)

All cable will be tested annually. (App 4 and 4a, Manual of Submarine Mine, 1912.)

In order to have a standard of comparison of the amount of work entailed by the above requirements, an average post will be considered. On this post we may assume two major-caliber disappearing guns batteries, two pits of seacoast mortars, two batteries minor-caliber guns, two searchlights, four power plants (25 K. W.), the usual buildings, and utilities. It has been the personal experience of the writer that in order to maintain all installations in such condition as to be ready for immediate service, a detachment of two officers and sixty enlisted men is required. This organization could be assigned to a two-gun battery of 3-inch guns for target practice, required to conduct small-arms practice, and have a limited amount of infantry drill without serious detriment to caretaking activities. It must be understood that this detachment could maintain all installations in such condition that, in the event of an emergency, a new organization could arrive at the post, man a battery and its stations, and, by simply removing the preservative coat of lubricant, go into action. It would be utterly impracticable to maintain installations in such condition for an equivalent amount of armament with a lesser number of officers and men. It is apparent, at once, that with the present strength of the Corps, the assignment of a detachment of this size to each fort in a harbor defense is out of the question. The supply problem at once becomes difficult due to inadequate harbor boat service.

Just a casual reading of the normal training requirements listed earlier in the article and also the routine caretaking requirements should be ample to convince anyone of the difficulty in training the Coast Artillery Corps to be soldiers and caretakers at the same time. The strength of the Corps in the United States is such that its full time employment on caretaking would barely suffice to "maintain fortifications in such condition as to insure full operation without delay," as required by the War Department policy. What, then, is the solution?

A reduction in training requirements has been advocated by a good many officers, so as to permit more time for care of equipment. Steps have already been taken in this direction by the modification of regulations for Coast Artil-

lery pertaining to the qualification of gunners and marksmen, wherein an enlisted man, unless drawing pay for such qualification, is required to qualify but once in an enlistment. A further improvement could be made by suitable target-practice assignments. Where there is but one "active" organization within a Harbor Defense (usually a Headquarters Battery), the assignment should be to two 3-inch seacoast guns and no more. Further, no organization should be expected to fire antiaircraft and mine practices within the same year. There has been an increasing sentiment within the Corps favoring a reduction in the amount of close order drill, ceremonies, and other kindred subjects. However, if we are to have excellent soldiers, there must be no lowering of the standards of proficiency in the various subjects which develop military bearing, discipline, morale, and splendid appearance. A well-disciplined, well-trained soldier is infinitely more valuable in an emergency than a caretaker.

A substantial increase in the strength of the Corps would undoubtedly be of benefit, but the futility of hoping for such an increase at the present is so apparent that it needs no discussion.

A policy which requires "fortifications . . . to be maintained in such condition as to insure full operation without delay in case of threatened emergency" anticipates the extreme and most unlikely condition. Can it be possible that, with our military intelligence and secret service departments, our close touch with the trend of international relations, and our well organized news agencies, the people of our seacoast cities could awaken any morning to find that a hostile expedition had landed and begun a victorious conquest of the country? The question of removal of fire-control equipment from stations should be left to Harbor Defense Commanders, subject to the approval of the next higher commanders. While complete removal is neither required nor justified in all instances, in a good many removal would insure better maintenance. The question of deterioration due to moisture has long since ceased to be as serious as the shortage of man power. If removal of equipment from stations to a central storage location will result in better condition and a reduction in time and labor required for its maintenance, thus releasing more men for straight duty with a combat unit, it should be permitted to the fullest extent.

We do not keep our mine fields planted in anticipation of this "threatened emergency" which requires everything else to be maintained in condition for immediate use. It is firmly believed that the reinstallation of all fire-control equipment removed from stations in a harbor defense would take no longer than planting the mine field pertaining to the same harbor defense. Since ample facilities exist at every garrisoned fort for training Harbor Defense manning details, keeping all equipment in the Harbor Defenses intact for this purpose is totally unnecessary. Neither is it necessary to keep equipment installed for purposes of inspection. The opinion of the technical personnel who make the various annual inspections of armament and communications is that removal of equipment and its inspection in a central storage location does not lessen the value of their inspection in acertaining conditions, but in most cases facilitates

their work and gives a truer indication of the condition of individual parts. A harbor defense is built up as a coordinated whole, as is an automobile. Yet a thorough inspection of a motor car does not consist in merely testing its running qualities. On the contrary, if inspection of its parts proves them to be in good order, it is more than reasonably certain that the car will run. While a running test is highly desirable, it is not considered necessary.

A balance must be struck if we are to continue to have a soldierly Corps. The only thing to do is "to cut the pattern to fit the cloth." Two steps are necessary; first, to reduce the amount of manual labor required for caretaking, and second, which logically follows the first, to reduce the number of caretakers required.

As to the first, a slight relaxation in the requirement, "maintaining equipment in condition for immediate use," would permit us to use the same method employed by the various staff branches in maintaining their surplus equipment. For example, the Ordnance Department has reached some very sound conclusions regarding the care of inactive Ordnance materiel and has published them in the various Field Service Bulletins. These cover in detail the proper steps to be taken in preparing materiel for storage. With the materiel once properly prepared, they further indicate that only the following routine care is required:

a. Examine piston rods at places covered by packing once every six months.
b. Clean and recoat traversing rollers every six months.
c. Traverse and elevate pieces within limits once each month.
d. Clean recoil cylinders once each year.
e. Examine fire-control instruments once every six months.
f. Thoroughly inspect one-half of one per cent annually.

The inspection provision conforms to the present method of inspecting condition of powder, *i. e.*, the condition of a sample is taken as the condition of the entire lot. A comparison of the requirements for maintaining "active" materiel and those for "inactive" materiel should convince the most skeptical that by classifying as "inactive" all armament in a harbor defense that is not to be fired by any of the Army components for peace-time training, the amount of routine work is tremendously reduced. Training Regulations permit a harbor defense commander to declare "inactive" all armament which, in his opinion, will not be needed until M-Day plus three months. This cannot be interpreted to mean that it would take three months' time to prepare "inactive" materiel for use. On the contrary, with any body of troops, assisted by one or two experienced soldiers and an Ordnance Machinist, it should take no longer than a week to prepare a battery for action. The same remarks can be made to apply to Engineer and Signal Corps equipment of the Coast Artillery.

The amount of labor required can be readily reduced by giving careful thought to the matter and by utilizing "short cuts" to attain the same end. Consider the painting of projectiles and number of man-hours spent in the past in accomplishing it. Heavy grease, or similar preservative compounds, would serve the same purpose and would certainly require less labor. The only ob-

jection to be raised against the use of grease is the possibility of dripping during warm weather and making unsightly spots on the concrete floor of the shot gallery. The labor saving certainly justifies the small concession to unsightliness. A careful study will disclose many other instances where methods are susceptible of improvement.

As to reducing the number of men on special duty as caretakers, the best method of accomplishing this is summarily to reduce the number to not less than one nor more than four, depending upon the size of the post. Then the amount of work expected of them should be rearranged so as to be within reason. Under the 1914 edition of Coast Artillery Drill Regulations, caretakers were expected to perform the duties indicated below.

> *a.* Care, preservation, and protection of all Government property.
>
> *b.* General police of the batteries, power plants, observing stations, and other public buildings and their immediate surroundings.
>
> *c.* Enforcing the regulations relating to persons coming on Government reservations and visiting or inspecting batteries or buildings. . . . *Coast Artillery materiel at such posts will be required to be maintained by caretakers at the same standard of condition as to appearance and functioning as that assigned to companies.*

With but two or three men as permanent caretakers at a post they should only be expected, first to keep the appearance of the post in general up to the highest standard possible, and second, to be constantly inspecting, on a prearranged schedule, the condition of the various buildings and installations, promptly reporting any deterioration they themselves are unable to remedy. They should be furnished with every labor-saving device practicable, such as power grass and lawn mowers, power buffers, polishers, and scrubbers, and spray-painting machines. Their work should be further facilitated by placing all installations in "inactive" storage. All movable property should be concentrated in a central storehouse. The caretaker's quarters should be adjacent to this storehouse. Excess and unserviceable property should be disposed of. The windows and doors of empty buildings, barracks, and quarters, should be battened down with wooden or similarly protective shutters. In other words, everything possible should be done in the beginning to decrease the amount of labor required for routine caretaking.

In the interest of securing high-class men for this duty, their pay should be at least equivalent to that of a Sergeant and they should be paid the regular commutation of rations at one dollar per day, under present rates. They should be furnished a comfortable set of quarters and these should be kept in a state of good repair. If the post is somewhat isolated, they should be furnished means of transportation, either a small boat with outboard motor or a small motor truck.

A general scheme of caretaking has been devised and put into effect in at least one District with such marked improvement in the condition of "out of service" installations in a short time that it may well be considered as being better than any of those used heretofore. The scheme may be equally well

applied to both small and large garrisoned harbor defenses. It is generally agreed that proper maintenance of "out of service" installations depends *primarily* upon *continuous inspection* of equipment and *constant supervision* of caretakers. It must be realized that neither the harbor defense commander nor any member of his staff, as now constituted, can devote the necessary time to secure this close supervision of outlying stations.

In order to provide for this, all the ungarrisoned forts should be grouped and placed under the command of a Coast Artillery officer, who is designated as "Fort Commander," "Outpost Officer," "Materiel Officer," or by some other appropriate title. He should be on the staff of the harbor defense commander and have no other duties assigned. His detail on courts and boards should be held to a minimum. His rank should be appropriate to the number of posts and amount of armament on a caretaking basis. In the larger commands, he might well be a field officer and have one or more junior assistants. In the small commands and with a shortage of officers, the duties of "Officer in Charge of Outposts" might be combined with those of the Commanding Officer of the Headquarters Battery, provided he is given no other duties. There can be no objection raised to the detail of an officer who could devote his *entire time* to the proper supervision and direction of caretaking when it is realized that almost ninety per cent of the batteries *are not manned* but are in the hands of caretakers.

He should be responsible directly to the harbor defense commander:

1. That all batteries are fully equipped with all tools, spare parts, accessories, communications, and fire-control instruments at all times.

2. That all Fort Record Books and Emplacement Books are posted to date.

3. That all equipment is kept in a proper state of police, repair, and preservation.

4. That any excessive deterioration in any structures is promptly reported to the harbor defense commander together with recommendations as to repair and prevention of further deterioration, and that a "follow-up" system is carried out.

5. That the post in general and all buildings, structures, and installations are in a proper state of police.

6. That all storerooms are neatly arranged, and that all property therein pertaining to a particular installation is properly tagged and in good condition.

7. That all installations are annually placed in a condition that will facilitate the regular inspection of the technical representatives of the Signal Corps and Ordnance Department.

8. That the supply of necessary preserving and cleaning materials (obtained from harbor defense staff officers) is prompt and adequate, reporting any inadequacies at once.

9. That the appearance, discipline, and proper utilization of the permanent caretakers and any working details sent to the outposts is up to the required standard. (In effect, he should command all caretakers, all orders being given either by or through the Outpost Officer.)

The Harbor Defense Artillery Engineers and Ordnance Officers should continue their periodic inspections, noting any deficiencies and reporting them through the harbor defense commander to the Outpost Officer, whose duty it is to have them corrected. Each inspection made should have as its mission not only an observation of general conditions but a *specific investigation* of the condition of *certain articles* of equipment or *parts* of installations, different each time, so that during a series of inspections all items will have been covered thoroughly. A list, similar to the Form No. 5, I. G. Dept., and applicable to Coast Artillery installations should be prepared and invariably used when inspecting.

In carrying out this scheme, the first step of the Officer in Charge of Outposts is to make a thorough general inspection of all posts on a caretaking basis, actually listing in detail all items requiring the employment of personnel in bringing equipment and installations to a proper standard of preservation. Then the inspection reports made by the technical representatives of the various staff branches for the preceding three or four years should be studied and the major features of all noted down. Next, all regulations pertaining to care and preservation of equipment and property should be carefully studied and lists made of all routine work required.

After a close analysis of the above, work schedules and task assignments should be prepared for each post and given to each caretaker every week in order to insure profitable employment of each man's time. It has been found that Reminder Lists for caretakers are of value. A sample abbreviated form is indicated below:

REMINDER LIST FOR CARETAKERS

Battery *Smith* Fort *Jones* Harbor Defenses of *Brown Bay*

For batteries "in commission" and either "in service" or "out of service" "active."

<table>
<tr><th>Month</th><th>January</th><th>February</th><th>March</th><th>April</th><th>May</th></tr>
<tr><td colspan="6">Weekly</td></tr>
<tr><td>Elevate and traverse guns</td><td>3 | 9 | 17 | 28</td><td>8 | 12 | 20 | 26</td><td>4 | 11 | 20 | 28</td><td>5 | 10 | 17 | 25</td><td>5 | 10 | 18 | 27</td></tr>
<tr><td>Operate electric motors</td><td>1 | 8 | 16 | 26</td><td>5 | 10 | 21 | 28</td><td>2 | 12 | 19 | 27</td><td>2 | 8 | 18 | 27</td><td>1 | 8 | 19 | 28</td></tr>
<tr><td>Etc.</td><td colspan="5"></td></tr>
<tr><td colspan="6">Monthly</td></tr>
<tr><td>Inspect Powder Magazines</td><td>15</td><td>14</td><td>17</td><td>18</td><td>16</td></tr>
<tr><td>Operate Gas Engines</td><td>12</td><td>15</td><td>16</td><td>13</td><td>19</td></tr>
<tr><td>Etc.</td><td colspan="5"></td></tr>
<tr><td colspan="6">Every three months</td></tr>
<tr><td>Withdraw barbette guns to normal recoil</td><td colspan="3">March 3</td><td colspan="2">June 10</td></tr>
<tr><td>Etc.</td><td colspan="5"></td></tr>
<tr><td colspan="6">Every six months</td></tr>
<tr><td>Clean recoil cylinders</td><td colspan="5">June 19</td></tr>
<tr><td>Etc.</td><td colspan="5"></td></tr>
<tr><td>Inspected by HD Comdr.</td><td>6</td><td>10</td><td>3</td><td>14</td><td>9</td></tr>
<tr><td>Etc. (Other Officers)</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

INSTRUCTIONS:

This form will be posted in each battery emplacement in a conspicuous place. The caretaker will enter in pencil the date each activity or operation is completed. While the caretaker will be unable to perform all tasks alone, it is his duty to request the necessary assistance. In addition to the above, the caretaker will be constantly alert to detect any deterioration he is unable to remedy, reporting at once to the Outpost Officer. The areas in the vicinity of stations and emplacements will be kept in a good state of police, grass neatly cut, brass polished, and high standard of appearance maintained.

Caretaker..
Name *Rank* *Org.*

A similar reminder list can be prepared for use at "inactive batteries."

All outposts should be visited by the Outpost Officer at least once a week when weather conditions permit. All the work that cannot be performed by the two or three caretakers must, of course, be performed by working details. Due to the distance involved it is usually undesirable to send details from the main post daily, as the time consumed in traveling to and from the outposts reduces the working day by half. It is believed that with a normal training schedule, there will be found two or three periods of favorable weather throughout the year of about four to six weeks each when large working details can be sent to the outposts and messes established. The District and Regimental training programs should set aside at least two periods during the year, one in the spring and another in the fall, which will permit the full time employment of the entire command, if necessary, on caretaking. Well planned and carried out, this will eliminate "lost motion" and provide for concerted and coordinated effort in caretaking, with improved results.

The work of the details, aptly called "flying squadrons," should be directed and supervised by the "Outpost" Officer. With a mess established at an outpost, the "squadron" might well include, when necessary, an Ordnance Machinist for armament work orders, a quartermaster carpenter and plumber for repair of Quartermaster buildings, and Engineer Corps employees for structural and non-structural repairs to fortifications.

The scheme as outlined is not proposed as an experiment. It has been thoroughly tried and found workable and furthermore has resulted in an improved condition in the equipment at ungarrisoned Coast Artillery forts. A Coast Artillery officer who serves as "Outpost Officer" for at least one year will gain a much more thorough general knowledge of his Corps and its weapons than is possible under the average assignment.

While the purpose of this article has not been to criticize any particular policy or method, an effort has been made to present a compilation of facts, the viewpoint of various officers, and suggestions for improvement in methods of caretaking. Its purpose will have been amply fulfilled if it contains any suggestions for partially effecting a lightening of the burdens of the Corps or if it results in even a slight decrease in the number of men on duty away from combat organizations.

Imperial vs. National Sea Power

By Captain Geo. J. B. Fisher, C. A. C.

EVERY sincere proponent of Anglo-American friendship must listen with regret to some utterances of leading personages on both sides of the Atlantic on the subject of naval armaments. We appear to be approaching the predicament of the two neighbors who became enemies after a prolonged and fruitless argument over the merits of their respective plumbing installations. There are some utilitarian appurtenances to civilization that are strictly personal, about which acrimonious discussion serves no good purpose. In this category are British and American cruisers.

After much talk, which is evidently leading nowhere, it is time to ask, Who started this argument, anyway? Historically, the United States must accept the responsibility for calling the Washington Conference of 1921; but, despite the outward facts, the real initiative was not wholly in Washington.

In March, 1920, the First Lord of the Admiralty announced that Great Britain would consider a one-power navy. By this he meant that the Mistress of the Seas was willing to see another ascend to her rank in naval power. Presumably the historical significance of this pronouncement did not register in the United States. So, a few months later this same official took occasion, in addressing Parliament, to remark that the British Government hoped to receive an invitation from Washington for an arms limitation conference.

Expressive propaganda commenced to appear, urging a reduction of naval strength. So active was this propaganda that the Naval Secret Service was obliged to report on it; and Mr. Harding, shortly after, took occasion to denounce publicly the covert attempts of foreign governments to influence domestic policies. However, the Washington Conference assembled in November, 1921, at the formal invitation of the United States; and Great Britain was wholly satisfied with the proposal of Mr. Hughes for theoretical naval parity.

The subsequent Geneva Conference of 1926 was merely an attempt to settle the unfinished business of the Washington Conference. It was assumed in the United States that the naval parity already agreed upon meant naval parity, not dreadnaught parity. It was supposed that a lapse of five years had afforded opportunity to find answers to the complicated questions of cruisers and submarines which the Washington Conference had been obliged to lay over; but it developed that five years, on the contrary, had merely served to emphasize the differences of the two nations on these issues.

As the Geneva Conference adjourned, each nation tacitly bowed to the necessity for following its own natural course in building non-capital ships. The delegates of each nation parted with a better understanding of the naval problems of their conferees and, understanding them, realized that further

limitation was impracticable. Our idealistic aspirations had encountered material facts which it was impossible for them to surmount.

It is now clear that the defensive armor which fits the British Empire is grotesquely misfitting to the United States. Similarly, the American suit of mail is quite inadaptable to British embonpoint. This is naturally so because of the structural variations of the two powers.

Each represents a fundamentally distinct political concept. Great Britain is the modern, glorified embodiment of the Empire. The United States exemplifies the plenary development of the Nation. That the two are dissimilar does not argue that the two are inimicable. That each insists on a defensive armor appropriate to the body which political evolution has provided, is a matter of common sense and should give rise to neither apprehension nor recrimination.

To apply the jargon of the economist, the British Empire is organized on the horizontal principle; the United States on the vertical. Both seek, in the remaining unindustrialized portions of the world, an exchange of raw materials for finished products. The British Empire (or Commonwealth of Nations, as it is now styled) pursues this end primarily by free trade among its political components. The United States follows more especially the theory of mutually advantageous trade in other world markets.

The British Empire comprises, roughly, an eighth of the habitable areas of the globe. Its dispersion and lack of homogenity would at first glance seem to indicate a lack of political cohesion. That the contrary is true is a tribute to English governmental genius.

The tenacity of the British Empire may be traced to the fact that the empire is of real value to the states which compose it. Whereas the British Isles originally exploited their dependencies, the situation is now quite reversed. A common pooling of economic interests safeguarded by adequate naval power, combined with a modicum of self government, presents the political equivalent of a powerful horizontal cartel. This structure is and must be largely supported by British sea power. The British Navy, challenged in turn by Spain, Holland, France, and Germany, but never defeated, is a considerable insurance at moderate cost for such states as Australia and the Union of South Africa.

But Downing Street realizes well enough that past glories alone do not guarantee the security of the modern British Commonwealth. Especially is the British Government sensitive to the least suggestion of senility. Its very existence demands a steady manifestation of virility, of ability to keep abreast of the present. Its far-flung empire is knitted together by ships, merchant and naval, and its paramount duty is to maintain adequate quantities of each.

In non-capital ships, Great Britain is partial to the cruiser and detests the submarine. This policy is clearly appropriate to her own peculiar naval problems. It coincides with the attitude of the United States in general, but not in particular.

In cruisers the British require quantity and, if any limitation is to be imposed, are obliged to sacrifice size. The United States is unable to sacrifice size for the very good reason that a cruiser with limited cruising radius is of

no value to us. These irreconcilable positions follow from cold geographical facts; the British have a world-wide empire, comprising innumerable naval havens from which small warships can operate, while the United States occupies a compact land area, virtually without overseas bases.

The inevitable conclusion is, therefore, that a sound basis for cruiser limitation between the two powers is nonexistent. But the fact that a mutually satisfactory schedule for limitation of this class of ship is lacking does not imply that the two nations are building competitively as they develop their cruiser programs. To some extent even the reverse may be inferred, since the large cruiser desired by the United States and the small cruiser favored by Great Britain are not tactically antagonistic. Certainly there is good ground for hoping that the purposes which they serve will never involve direct combat.

The British Empire, penetrating as it does every quarter of the globe, is sensitive to all the stresses and strains of international affairs. It is indispensable that the imperial lines of communication be kept open at all times and at all odds. Unfortunate though it may be, the only certain means of achieving this end is by having at hand adequate sea power to repress instantly any attack.

The naval needs of the United States, on the other hand, are in some measure fulfilled by the "fleet in being" rather than by the "fleet in action."

Our international interests are not of such a nature as to render the United States liable to attack from many quarters. While the seeds from which wars spring are innumerable in the case of the British Empire, they are much fewer in the case of the United States. The primary function of the American navy is of course to repulse attack, but its very important secondary function is to afford foreign policies that material support which renders them authoritative.

Especially is this support necessary when the United States engages in the rôle of neutrality. We were buffeted about during the Napoleonic era, and even had to fight England, because our naval strength was insufficient to command respect for our commerce on the high seas. And we were brought into the World War because there was no cold steel behind the famous notes of 1916. There is no reason to suppose that in future wars, even though we avoid participation, our diplomatic remonstrations will be taken seriously without adequate sea power in the background.

Peacetime as well as wartime diplomacy has in the past reflected very directly the adequacy of the American navy. Fifty years of effort failed to bring about an abrogation of the Clayton-Bulwer Treaty, yet the naval efficiency demonstrated during the war with Spain was quickly followed by a satisfactory adjustment of vexing Central American problems. The vigorous foreign policies of Mr. Roosevelt would have involved war had they not been supported by tangible strength afloat.

It is therefore a fairly accurate generalization to state that, while the British navy exists to fight, the American navy exists to avoid fighting. But each requires a proportionate strength to accomplish its mission.

As these two navies increase in strength, there is always at hand the professional alarmist with his dire predictions of coming war. The possibility of

armed conflict between Great Britain and the United States, however, is in fact extremely remote.

The British government is, like our own, compounded of statesmen and politicians; except that the statesmen may have a firmer control of affairs in London than is the case in Washington. History during the last two or three decades is replete with incidents which show that the British statesman is actuated by a determination to conciliate the United States. He is often offset by the politician who, to placate the proletariat, may denounce him or even, as in the case of Sir Edward Grey, turn him out of office. Nevertheless, since the days of John Hay and Sir Julian Pauncefote, there has been no occasion seriously to complain of our treatment at the hands of the British. With reasonable steadiness in Washington we need have no fear of a *casus belli* from London.

The real reason for this is two-fold. In the first place the Englishman has a deep aversion to fighting us; not necessarily from fear nor because of past experience, but simply because he does not care to accept the awful gamble which such a fight entails. In the second place, he realizes fully that the British Empire would not survive such an internecine struggle.

Yet, despite his lack of actual enmity, it is no easy matter for the average Englishman to become reconciled to the one-power naval standard to which he was so glibly committed in 1920. He requires time and not a little vociferation before his system will accommodate itself to so radical a variation from the past. As a matter of human equity, he is due the privilege of slowly assimilating the distasteful dose which he is obliged to accept.

The English who govern the British Empire have on occasion been accused of lack of foresight; but never of lack of ability to meet a concrete situation. The tremendous wealth and vitality of the United States of America is one of the outstanding facts of the present era—appreciated less at home, probably, than abroad. The well informed British certainly have a clear understanding of the comparative present and future, and realize that a naval development appropriate to the material prestige of the United States is not to be gainsaid.

It may be that all the plethora of naval limitations from which we have lately suffered came about as a conscious or unconscious effort on the part of Great Britain to evade the essential facts of contemporary history. Encountering an adamant spirit in high places on this side of the Atlantic, however, it is inevitable that British statesmanship will pursue the sensible course and shape policies which will support harmony rather than engender antagonism between the imperial navy and its national counterpart.

Colonial Forts on the Pacific Coast

I. Exploration

THE Western Coasts of North America were, at various times, claimed in whole or in part by Spain, Russia, France, England, Mexico, and the United States. The Spanish, making the original discovery of the Pacific Ocean at Panama, gradually worked their way up the coast, establishing settlements as far north as Nootka Sound, in British Columbia. They did not, however, actively press any claim to territory beyond the forty-second parallel of North latitude. The Russians, crossing to America from Kamchatka, established their southernmost settlement on Bodega Bay, in California, but their recognized southern boundary line rested on the famous "fifty-four forty" parallel. France felt that possession of Canada and of Louisiana entitled her to a place on the Pacific, but the French-and-Indian War practically extinguished her pretensions. After taking Canada from France, England laid claim to all western territory from Russian America to the Columbia River. The United States held that the Louisiana Purchase and original discoveries entitled this country to the shore-line from California to the Russian Province. Mexico succeeded to the Spanish claims in 1821.

Vasco Nuñez de Balboa established the Spanish claim in 1513, when he discovered the "South Sea" and promptly took possession for Spain of the ocean and of all lands and islands washed by it. The voyage of Magellanes in 1519-22 informed the world of the vast extent of the Pacific, which was in fact a Spanish ocean for a great many years. The efforts of Cortes early secured Mexico and Lower California for Spain, and started the voyages which led to the discovery and settlement of Upper California.

In 1542 Juan Rodriguez Cabrillo discovered San Diego Harbor and sailed along the shores of Alta California as far as Cape Mendocino. He died in January, 1543, and his chief pilot, Bartolome Ferrelo, continued the explorations as far as the vicinity of Cape Blanco, in Oregon, where he turned southward and returned to Navidad, in New Spain. Juan de Fuca, according to somewhat doubtful evidence, sailed further north in 1592 and discovered the strait which bears his name. In 1602-03 General Sebastian Viscaino explored the coasts, entered the harbors of San Diego and Monterey, and reached the forty-third parallel of latitude. In the sixty ensuing years the Spanish made twenty or more voyages of exploration along these coasts under the impression that valuable minerals and precious stones were to be found; but we hear little from this territory for more than a century and a half after Viscaino visited its shores.

In 1774 Ensign Juan Perez explored southward from fifty-four degrees North latitude to Monterey and discovered San Lorenzo Harbor, which afterward became known as Nootka Sound. The following year Captain Bruno Heceta, in the Corvette *Santiago*, and Juan Francisco de la Bodega y Quadra,

in the small schooner *Sonora*, sailed on another expedition of exploration, Quadra reaching the fifty-eighth parallel before sickness among the crew forced his return. In 1788 Estevan Jose Martinez, in the corvette *Princessa*, and Lieutenant Gonzalo Haro, in the schooner *San Carlos*, proceeded to the sixtieth parallel of latitude, and thence southwestward as far as Unalaska, examining the Russian settlements in that part of the world.

The English flag made its first appearance on the coast in 1578, when Francis Drake made his famous buccaneering expedition along the Spanish Main. Sighting land in the vicinity reached by Ferrelo, Drake turned south and put in at Drake's Bay, near Point de los Reyes. Here he brought his ship to anchor near the shore, and landed men to set up tents and build a barricade around them. Having provided a suitable defense, he disembarked, stored his cargo within his fort, carcened the ship on shore, and set to work overhauling and repairing damages. During his short visit to the country, which he named New Albion, Drake took possession in the name of his sovereign, but after thirty-six days spent in preparing the *Golden Hind* for further sea service, he abandoned his fort and set sail on the long homeward voyage.

Not until 1778 was England again represented on the Pacific Coast. In that year Captain James Cook did some excellent geographical work from Nootka Sound through Bering Strait to Icy Cape, in the latitude of seventy degrees twenty-nine minutes. In succeeding years the British flag was flown along the shores by Vancouver, Meares, Portlock, Dixon, and many other traders and navigators; the French flag by Perouse; and the American flag by Kendrick, Gray, and others. All along the northwest coast, traders of many nations appeared, and before long the Pacific shores were well known to the navigators of the world.

Meanwhile the Russians had come from the Northwest. In 1728 Vitus Bering sailed through the strait which bears his name and proved that Asia and America were not united. In 1731 Gvosdof was blown ashore on the American coast near Norton Sound. In 1741 Bering and Alexei Ilich Chirikof explored the southern shores of Alaska. Chirikof reached Sitka and returned to Kamchatka; Bering saw and named Mount Sitka, and wintered on Bering's Island where he died. Voyages by Emilian Bassof, Mikhail Nevodchikof, Andrei Tolstykh, and others in the ensuing years, and explorations by Synd, Krenitzen, and Levarschef between 1766 and 1769 added to the information concerning the Alaskan coast and established the Russian claim to that part of America.

II. California

The Spanish court recognized the importance of the permanent occupation of California, but troubles both at home and abroad rendered postponement unavoidable. Spurred at last into action by the advance of the Russians from the north, Spain finally determined to secure the coasts to the north of New Spain. In 1768 the Marquis de Croix, Viceroy of New Spain, instructed Don Jose de Galvaez, Visitador General of New Spain, to occupy and fortify San

Diego and Monterey. By July, 1769, a settlement of one hundred and twenty-six persons had been made at San Diego, the defenses consisting at first of but a palisaded enclosure. In the summer of 1770 Monterey was established from San Diego, and the harbor of San Francisco was discovered by Don Gaspar de Portola, Military Governor of California.

The Spanish occupation was both military and religious in character. The settlements consisted, for the most part, of missions to which detachments of a corporal and two or three men were attached. To protect the missions and to secure the country against invasion, the frontier was guarded by a line of forts or, as they were called, presidios. The provision of a system of regular defense against foreign invasion by way of the seacoast was found to present considerable difficulty. A distant province, with no resources of its own, could scarcely maintain extensive fortifications, so it was decided to provide each coast presidio with a battery of eight 12-pounders, manned by a small detachment of artillerymen, as protection against corsairs and privateers.

The early presidios were usually of temporary construction and were improved from time to time. The batteries supporting the coast presidios were half-finished or half-decayed structures, called forts or castillos, to each of which half a dozen soldiers were detailed. Duflot de Mofras says:*

> All of the presidios were established on the same plan. Choosing a favorable place, they surrounded it with a ditch twelve feet wide and six feet deep; the earth of the ditch served as an outwork. The enclosure of a pueblo was formed of a quadrilateral, six hundred feet square. The rampart, built of brick, was twelve feet high by three in thickness; small bastions flanked the ankles. Its armament consisted of eight bronze cannon; eight, twelve, and sixteen pounders.
>
> Although incapable of resisting an attack by ships of war, these fortifications were sufficient to repel the incursions of the Indians. Not far from the presidios, according to the topography of the land, was an open battery, pompously styled the castle.

In California there were four of these presidios along the coast—one at San Diego, one at Monterey, one at San Francisco, and one at Santa Barbara, the chief harbors of the province. Each was protected by high adobe walls on which a few small guns were mounted, but the garrisons were small and were rarely to be found within the fortifications. Under the Spanish system, one part of a fortification could fall into decay while another part was being repaired, so it is safe to say that none of the presidios or their attached forts were ever really in condition for service.

The Presido of San Diego, established in 1769, was located at one of the most important points in Alta California, but it was, nevertheless, always a weak fortification. Vancouver, who visited the presidios in 1792-93, says:†

> The presidio at San Diego seems to be the least of the Spanish establishments. It was irregularly built, on very uneven ground . . . With little difficulty it might be rendered a place of considerable strength by establishing a small fort at

* Vide Blackmar, *Spanish Institutions in the Southwest.*

† Op. cit.

the entrance of the port; where at this time there are neither works, guns, houses nor other habitations nearer than the presidio five miles from the port and where they have only three small pieces of brass cannon.

Of the Presidio of Monterey, which had been established in 1770 and had not been greatly altered, Vancouver said that the buildings formed a parallelogram three hundred yards long by two hundred and fifty wide. At each corner was a small bastion, which projected a little beyond the wall. Before the entrance, which faced the bay, were four 9-pounders and three 3-pounders, all of these guns being on the ground without fortification. They were so far from the water and so poorly protected that they accomplished nothing as a means of defense. Nevertheless, the central location of Monterey made it a station of great military importance, and for a long time it was the capital of the province.

The Presidio of Santa Barbara was established in 1782, but no fort was ever built there and no artillerymen were detailed to man the occasional gun to be found at that station.

The Presidio of San Francisco was dedicated in 1776, but when Vancouver entered the bay in 1793, he was saluted by a brass 3-pounder tied to a log. He says that he saw another cannon mounted on a decayed carriage in front of the presidio. Later, however, Fort Point, was occupied, and in the course of time Fort San Joaquin was put up, although its construction was faulty and it was practically useless as a means of defense.

In 1772-73, after the establishment of the Presidio of Monterey, the military establishment of Alta California was reorganized according to a plan developed by Juan José Echeveste. The Californian army thus established provided a commandante, a sergeant, two corporals, twenty-two soldiers, two carpenters two blacksmiths, four muleteers and a storekeeper at Monterey; and two sergeants, two corporals, twenty-two soldiers, two carpenters, two blacksmiths and a storekeeper at San Diego. For the five missions then existing in Alta California (San Diego, San Carlos de Monterey, San Antonio de Padua, San Gabriel, and San Luis Obispo), the project provided five corporals, and twenty-five soldiers.

In 1776 Lieutenant José Joaquin Morega, pursuant to orders from Viceroy Bucareli, proceeded to San Franciso and established the Presidio of San Franciso. Arriving at Fort Point, Moraga declared the site suitable for a presidio and a fort. His expedition, consisting of Fathers Benito Palou and Pedro Benito Cambon, Sergeant Pablo Grijalba, two corporals, sixteen soldiers, seven pobladores or settlers, and the families of the enlisted men and the pobladores, pitched their tents late in June on the bank of the lagoon known as Nuestra Señora de los Dolores. On the eastern slope of the hill or point forming the southern side of the Golden Gate, Morega selected for the presidio a site within view of the entrance of the port and not far from the place where the fort was to be constructed. The initial armament for these defenses consisted of two swivel guns brought from Monterey by boat.

As late as 1777 the presidios were mere huts within frail palisades, but a year later Monterey was protected by a stone wall five hundred and thirty-seven yards in circumference, four feet thick, and twelve feet high. In San Francisco, adobe walls were being built, but they were destroyed in the winter of 1779 by heavy rains. Santa Barbara was added to the list of presidios in 1782 by Governor Felipe de Neve. This establishment was located on a plain sloping gradually to the sea, directly in front of the roadstead, and near an eminence suitable for a fort.

Governor José de Arrillaga arrived in Alta California in 1792 and proceeded to inspect the presidios and forts. He found that the colony was entirely defenseless and could offer no resistance to an armed vessel entering any one of the ports. At San Francisco there was but a single gun of small caliber and of questionable serviceability. At Monterey there was some ordnance left there by Bodega y Quadra the preceding year, but there were no gunners to man the batteries. Santa Barbara and San Diego were in somewhat more habitable condition than the others. Arrillaga saw that he must look to his defenses.

After ordering the repair of the other presidios, Arrillaga proceeded to San Francisco in August, 1793, and selected, as the site for a fort, the bluff forming the extreme northern point of the peninsula of San Francisco and the southern side of the Golden Gate, later named Fort Point. Finding none of his own people who were qualified masons, he was forced to employ one Toribio Ruiz, a roving journeyman who had drifted into Monterey the preceding year. Under Ruiz as architect, superintendent, and builder, the fort was constructed, and in it were placed eight brass 9-pounders that had come from San Blas this same year. The fort, completed in 1794 at a cost exceeding six thousand dollars, became known as Fort San Joaquin.

Diego de Borica succeeded Arrillaga as governor in 1794 and found that very little had been accomplished toward improving the condition of the coast defenses of the country. San Francisco and Monterey had a few guns, but the rest of the province was defenseless. The governor's anxiety was increased because Spain had declared war on France in 1793 and he feared an invasion by the French. He had only about two hundred and seventy-five soldiers in the colony—some sixty at each of the presidios of San Diego, Santa Barbara, and Monterey, thirty-six at San Francisco, and the rest scattered among the several missions. This force was strengthened in 1794 when Viceroy Brancifort ordered from San Blas to California a company of Catalonian volunteers for general service and a detachment consisting of one sergeant, three corporals, and fourteen artillerymen to man the batteries at San Francisco and Monterey. At the same time, the Marine Department, directed by the Viceroy, sent the *Concepcion,* a small war vessel, to assist in guarding the coasts of California.

In 1796 Alberto de Cordoba, a military engineer, inspected the three fortified presidios and declared the works at these places entirely useless. At Monterey, vessels could easily anchor and land men out of range of the guns

of the battery, which consisted of a few logs, irregularly placed, behind which stood about eleven guns. At San Francisco only two of the guns could send a projectile entirely across the entrance of the bay, and then only when elevated to an angle which destroyed precision of fire. The horseshoe-shaped fort, its walls of adobe and its embrasures of brick, mounted eight guns, but of the three 24-pounders which it possessed, one was unserviceable. The remaining guns were so poorly mounted as to afford little or no protection against attack. Point Guijarros, at San Diego, had been chosen in 1795 as the site for a fort of ten guns, but the works were not completed until after 1800.

Cordoba at once started upon the more pressing repairs and improvements at Fort San Joaquin. After preparing the project of rehabilitation there, he was called to do the same for the presidios of San Diego and Santa Barbara. In the spring of 1797 he was ordered back to San Francisco by Governor Borica to take charge and to hasten the repairs and improvements at the fort and also to construct a battery so sited as to prevent the occupation of the anchorage at Yerba Buena. This battery, which was built on Point Médanos (Point San José, Black Point) and which was called the Bateria de la Yerba Buena, was a less elaborate work than San Joaquin, being constructed largely of brushwood fascines, with eight embrasures and five 8-pounder cannon. No garrison was kept here, but the work was visited daily and, to some extent, kept in order.

In this same year, Borica also had a battery built at San Diego on Point Guijarros (Loma). This work was an earthwork with a plank-and-stone magazine in the rear and with an armament consisting of eight brass 9-pounders in serviceable condition. As the fort was at some distance from the presidio, the soldiers assigned to the guns were seldom to be found at the battery.

In the spring of 1803 Captain William Shaler, in the brig *Lelia Byrd*, entered the harbor at San Diego to trade for otter skins. As such trade was forbidden to foreigners, the commandante of the presidial establishment, Don Manuel Rodriguez, directed Captain Shaler to put to sea as soon as he had obtained some necessary supplies. An attempt at surreptitious trading was discovered by Rodriguez, who was so incensed that Captain Shaler deemed it prudent to put to sea at once, particularly since his vessel carried but six 3-pounders, far inferior in both range and power to the guns in the fort.

The brig, in running for the entrance to the harbor, would have to pass the fort at close range, so the Spaniards manned their guns and opened fire. As the vessel drew abreast the fort, the little 3-pounders replied valiantly to the fire of the heavier guns. At the first volley, the townspeople, who had assembled to see the fight, fled from the vicinity of the fort; at the second volley, the artillerymen deserted their guns with equal expedition, with the exception of one man who stood on the parapet waving his arms to signify that the battle was over. The combat, or at least the firing from the fort, had lasted three-quarters of an hour, but the brig successfully ran past and drew out of range. There is no record that any blood was shed in the exchange of fire, but the *Lelia Byrd* was considerably damaged and had to put in at San Quentin for repairs.

When Governor Borica left Alta California in 1800, Arrillaga became governor for the second time. As before, his first care on assuming office was to inspect the various presidios and military establishments, and, as before, he found them in what he called an unhappy and deplorable state. There was a battery at Yerba Buena, one at San Francisco, one at Monterey, and one at San Diego; but they amounted to very little for defensive purposes. Not only had no substantial repairs been made for a number of years, but several severe storms had caused great damage. There were but eighteen artillerymen assigned to all the batteries of the province; and not one of the works could successfully have resisted a single ship of war. In 1805 coast defense once again became the subject of deliberation at the capital in Mexico.

At San Francisco, a hurricane of wind and rain in the winter of 1798-99 had battered down the adobe walls of the fortifications there; and in February, 1802, another furious storm completed the destruction of the defenses and ruined the ordnance. Some repairs were effected in this year, but in 1805, following a third storm in 1804, Fort San Joaquin was provided with three sides of stone and one of palisade and with a new casemate three hundred yards away. All the work was done by Indian convicts, and we may assume that it was but indifferently performed. In July, 1805, Arrillaga reported that Fort San Joaquin was well located but needed repairs. At that time but three of the ten guns of the fort were in good condition.

The storm of November, 1804, leveled the palisade which enclosed the battery at Yerba Buena and did other serious damage. Commandante Arguello decided that the battery ought to be relocated on the hill nearer the anchorage, perhaps the slope of Telegraph Hill.

At Santa Barbara, the buildings were in a somewhat better condition, but there was only a single cannon. In 1806 the presidial artillery consisted of eight guns from one to six-pounders, of which half were distributed among the missions. Shaler, who visited the presidio about this time, said that Santa Barbara "has only the show of resistance and would fall an easy conquest to the smallest ship of war."

At Monterey the condition of affairs was little better. Shaler said in 1805: "There is a miserable battery on a hill that commands the anchorage, but it is altogether inadequate to what it is intended for." There were ten guns from three to eight pounds in size, but they were not in particularly good condition.

At San Diego the situation resembled that at San Francisco, except that the guns on Point Guijarros were serviceable. They were, however, so poorly mounted that they were almost useless. Four or five artillerymen were kept at the fort, and a few minor repairs were effected during the first few years of the century. Shaler said: "There is a sorry battery of eight-pounders at the entrance, at present it does not merit the least consideration as a fortification, but with a little expense might be made capable of defending this fine harbor."

The troops in California were in general an idle and spiritless lot who did little for the province but who were sufficient to keep in check the more idle and more spiritless Indians living near the settlements. There was no longer

any expectation of attack by a foreign power, and the military establishment—men, forts and material—was allowed to deteriorate to an almost useless condition. It can not truthfully be said that California possessed any coast defenses in the years following the opening of the nineteenth century.

In 1812 Governor Baranoff, of Alaska, sent M. de Koskoff with one hundred Russians and one hundred Kodiak Indians to establish a settlement on the shores of Bodega Bay. There a palisaded fort was built in 1813, but in 1820 Fort Ross was built further up, on the cliffs at Sonoma. This fort was a square inclosure with round bastions and with adobe walls twelve feet high pierced with embrasures. At opposite corners were two bastions, two stories high, furnished with six pieces of artillery. This settlement was intended to be a trading post of the Russian-American Fur Company, and here the settlers kept up their hunting and fishing until 1841, when they sold their interests and abandoned the site.

In 1815 Pablo Vicente de Sola became governor of California and, like his predecessors, opened his administration with an inspection of the defenses of the country. The Presidio of San Francisco was in a most acute stage of decay, but the other presidios were in fair condition, although none of them was any more suitable than it had ever been for defense. There were but forty-two cannon in the province, and half of them were useless. Of these guns, not to exceed twenty-two were of sufficient power to have any value in coast defense. These were three 24-pounders, one 16-pounder, five 12-pounders, and thirteen 8-pounders. The remaining twenty were smaller. Fifteen of these cannon, including the 24-pounders, were at San Francisco, twelve at Monterey, seven at San Diego, two small ones at Santa Barbara, and six small ones distributed among the missions.

Shortly after Sola arrived, Lieutenant Luis Antonio Arguello, commandante at San Francisco, decided that he would repair his post without waiting for the unwinding of red tape to secure a permission which might or might not be given. Building himself a launch, he used it to tow redwood logs from Corte de Madiera, twelve miles distant, until he had enough for his purposes. The governor, at Monterey, learned of this activity and became furious, claiming that Arguello was guilty of insubordination in so acting without the knowledge and consent of his governor. Obeying the governor's order, Arguello reported promptly at Monterey where he so impressed Sola by his bearing that the governor withdrew all objections to the work and the two men became fast friends. Later the governor agreed that the repairs to the fort were justified—but he kept the launch at Monterey.

During his administration, Sola did not accomplish much toward improving the fortifications. In 1817 he had the battery at Monterey repaired with masonry, but he appears to have done nothing at Santa Barbara or San Diego. Of Yerba Buena, nothing is heard during this decade.

In November, 1818, two privateers from Buenos Ayres, the *Argentina* of thirty-eight guns and the *Santa Rosa* of twenty-eight guns, appeared off Mon-

terey. General Hyppolite Bouchard, a Frenchman who commanded the expedition, demanded the surrender of the presidio. When Sola sent back a defiant reply, the *Santa Rosa* opened fire upon the shore battery, which replied with its eight 6- and 8-pounders. The engagement lasted for about two hours, at the end of which time the *Santa Rosa* was badly battered. Bouchard then landed his troops and captured the presidio, after which he carried off or spiked the cannon and plundered the inhabitants. At the end of five days, after completing repairs to the vessels, the privateers set fire to the presidio, re-embarked, and put out to sea. In a few months the presidio and the buildings were rebuilt, and Monterey was in better condition than before the attack.

At this time in the history of California, all coast defenses were being neglected. Internal politics were absorbing all attention, and international questions were, perforce, not considered. In 1822 Mexico succeeded in becoming independent of Spain, and California became a Mexican province.

In 1824 Kotzebue, the Russian explorer, entered San Francisco Bay and found "St. Joachim on his rocky throne, truly a very peaceable and well-disposed saint; no one of his cannon in condition to fire a single shot." According to his own statement, Kotzebue had to lend the fort the powder with which it fired the saluate in his honor, but the records show that a shipment of forty kegs had been received two months before the explorer arrived.

In 1826 an investigating committee reported that the fort on Point Guijarros, at San Diego, was in a deplorable state and required no less than two thousand dollars for repairs. No money was forthcoming, but in May, 1828, ten men were set to work upon the battery. The works were improved somewhat, but it was not long before the six or eight artillerymen were withdrawn from the presidio. No garrison was maintained for Point Guijarros after 1835, nor for the presidio itself after 1837.

An investigation in 1839 showed that there were two serviceable guns, out of nine, located at San Diego. In January, 1840, the remnants of the fort and casemate were sold to Juan Machado for forty dollars. The serviceable guns may have been removed; and the remainder, after having been spiked by an American captain in 1842, are said to have been thrown into the bay during the war of 1846-7.

The Russian settlement at Fort Ross grew to about three hundred persons. By 1833 the fort was somewhat out of repair. At that time this work was an enclosure, one hundred yards square. At two diagonally opposite corners, one on the seaward and one on the landward side, were octagonal blockhouses of hewn logs, with embrasures, each furnished with six 8-pounders. A large building at the main gate also had embrasures and six cannon. Three other guns were located at the quarters of the commandante. The walls and buildings were of wood and were not sufficient as a defense against artillery.

The hunting and trading for which the Russians had entered the country had much decreased, and conditions were growing worse with each passing year. In 1841 they disposed of their holdings to John A. Sutter and withdrew from California. On January 2, 1842, the Mexican flag was raised over Fort

Ross, but for want of military resources, no large or regular force was ever maintained there.

When Lieutenant Colonel Nicolas Guiterrez became governor of California in 1836, the province was seething with rebellion. Guiterrez came to power just in time to be instrumental in bringing about the open rupture, for an argument with Jean Bautist Alvorado, an auditor in the customs service, precipitated the trouble. The people rose in open revolt, and Guiterrez called all troops who still obeyed him into the presidio of Monterey, withdrawing even those who were stationed at the fort. Alvorado quietly pushed forward in the night and occupied the abandoned works. By firing one shot at the presidio (the only round for which he could secure powder), Alvorado brought Guiterrez to terms. The governor left the province, and California became "El Estado libre y soberano de la Alta California." Alvorado was appointed *gobernado interino* by the authorities in Mexico in 1838, and *gobernador proprietario* in 1839, whereupon California resumed its allegiance to Mexico.

In 1839 John A. Sutter, with ten Americans and ten Hawaiians, landed near the present site of the city of Sacramento and built Sutter's Fort—a private establishment countenanced by the governor.

In 1838 the artillery in California had been reduced to about thirty pieces, well scattered. These included three iron 24-pounders, eight 8-pounders, ten 4-pounders, and one 2-pounder, some of them dismounted.

In October, 1842, Commodore Thomas Ap Catesby Jones, under the impression that the United States and Mexico were at war, entered the harbor of Monterey with the frigate *United States* and the sloop-of-war *Cyane*, landed his men, captured the fort, raised the American flag, and declared California a territory of the United States. Discovering his mistake, Jones hauled down his flag the next day, apologized to the Californian and Mexican authorities, and departed.

At San Diego, Phelps, master of the American ship *Alert*, heard of the capture of Monterey by Jones and proceeded to capture the works at Point Guijarros and spike the guns. Mofras says that at this time there were a few soldiers and an officer at the presidio and a few half-buried cannon among the ruins of the presidio and the fort at San Diego. By 1845 the fort at Monterey had about twelve men and three or four serviceable guns.

War was declared by Mexico against the United States in May, 1846; and Commodore Sloat, commanding the American Pacific squadron, was ordered to secure possession of Upper California. On the second of July, Sloat, in the *Savannah*, reached Monterey, where he found the *Cyane* and the *Levant*. On the morning of the seventh he sent Captain Mervine to demand the surrender of Monterey. The governor replied that he was not authorized to surrender the place, so Sloat landed a force of two hundred sailors and marines and took possession of the town.

On the ninth, Commander Montgomery of the *Portsmouth*, pursuant to orders from Sloat, took possession of Yerba Buena and San Francisco Bay, of

Sutter's Fort on the Sacramento, of Bodega, and of Sonoma. Lieutenant Mussroon proceeded with a detachment against Fort San Joaquin and the presidio and found them dilapidated and abandoned. Three old Spanish brass or bronze pieces, three iron 24-pounders, and four smaller iron guns, all of them spiked or useless, were lying exposed to the weather. The adobe walls were crumbled and the tile roofs had fallen in, but notwithstanding the general condition of the defenses, Mussroon hoisted the Stars and Stripes over the fort.

In January, 1847, Lieutenant Henry Wagner Hallics, of the United States Topographical Engineers, was detailed to erect fortifications at Monterey and San Francisco. At Monterey a company of one hundred and eighty men, under Lieutenant E. O. C. Ord, built a fort on the hill overlooking the anchorage and mounted therein some guns brought out by the *Lexington.* This fort was constructed of wood, the magazine being of logs dove-tailed together; and the whole was surrounded by a palisade of stakes. Fort Montgomery, at San Francisco, was a battery built on the eastern side of Telegraph Hill.

These two American works closed the construction of fortifications during the colonial period in California. Of the Mexican and Spanish works, scarce a vestige remained. Never very strong, they were now decayed beyond repair and were about to become the property of the United States. The treaty between Mexico and the United States was signed on February 2, 1848, and ratification were exchanged on May 30. California thus brought to a close its colonial existence and took up its new status as an American Territory.

III. Oregon and Washington

The forts erected along the shores and on the navigable waters of Oregon and Washington were, for the most part, put up by fur-trading companies for their own protection. The term "fort" was applied indiscriminately to all fur-trading establishments having any pretensions to permanency, whether a bastioned fortress of stone or wood, or merely a stockade, palisade, or picketed enclosure consisting of sharpened poles or slabs.

The first attempt to establish a settlement within the geographical limits of these States was made by the Spanish in 1792, when Lieutenant Salvador Fidalgo was sent to build a fort at Port Nuñez Gaona (Neah Bay). This site was abandoned the same year before completion of the defenses.

In 1810 the Pacific Fur Company was organized in New York with John Jacob Astor at its head. In March of the following year, the first vessel of that company entered the mouth of the Columbia River to establish a trading-post. Captain Thorne determined to build the station on Point George, on the south bank of the river and about ten miles from its mouth. Bringing his vessel, the *Tonquin,* to this point, he landed his passengers and goods, and began the erection of the fort and buildings of a settlement which he named Astoria. Palisades were put up and in bastions at either end were mounted four small cannon.

The post was not destined to remain long in American possession, for in October, 1813, largely because of the war between England and the United States, the interests of the Pacific Fur Company were purchased by a British rival, the Northwest Fur Company. In December the British sloop-of-war *Racoon* arrived to capture the American settlement, but as it had already been sold, the capture consisted solely in substituting the British flag for that of the United States and in changing the name of the establishment to Fort George.

The treaty of peace between the United States and Great Britain, signed at Ghent in December, 1814, provided for the mutual restoration of conquests; and Fort George was, in due form, delivered to Mr. J. B. Prevost in October, 1818. At that time the post consisted of a stockade made of pine logs, twelve feet in length above ground, enclosing a parallelogram of one hundred and fifty by two hundred and fifty feet, defended by bastions at two opposite angles. The ordnance consisted of two 18-pounders, six 6-pounders, four 4-pounder carronades, two 6-pounder coehorns, and seven swivel guns, all mounted.

In 1821 the Hudson Bay Company and the Northwest Fur Company were merged under the name of the former organization. In 1823 Doctor John McLoughlin, who was appointed chief factor for the Oregon region, proceeded to the Columbia River, establishing new posts and strengthening old ones. In 1825 he built Fort Vancouver, which soon became the principal depot of the Hudson Bay Company west of the Rocky Mountains. This post stood on a gentle slope, four hundred yards from the shore and about one hundred and twenty miles from the mouth of the Columbia River. The fort was simply a large, stockaded enclosure, one hundred and fifty by two hundred and fifty yards, containing houses, magazines, and workshops.

With the transfer of the fur company from Astoria to Vancouver, Fort George became a lookout and trading station of little importance. By 1834 it no longer deserved to be called a fort, and in 1841 Du Mofras described it as "a miserable squatters' place, invested by the rival American and English factions, with the pompous name of Fort George and town of Astoria, the fort being represented by a bald spot, from which the vestige of buildings had long since disappeared, and the town by a cabin and a shed." Much of the dilapidation was caused by a fire which occurred in 1820.

Two other forts were erected by the Hudson Bay Company on the coasts of Oregon and Washington. Fort Umpqua was built near the mouth of the Umpqua River, which enters the Pacific about one hundred and eighty miles south of the Columbia and affords a harbor for small vessels. Fort Nusqually was erected in 1832 at the mouth of a little river emptying into the southern end of Puget Sound.

While the dispute continued between Great Britain and the United States over the northwestern boundary, neither nation attempted to occupy the territory by force of arms. The settlement came in 1856 when a treaty between the two countries fixed upon the forty-ninth parallel as the permanent dividing line between the two countries. Thus Oregon and Washington came into the

Union, the only portion of these United States acquired by means other than combat or purchase.

IV. Alaska

Russia, turning her eyes eastward across the vast wastes of Siberia, saw the other nations of Europe engaged in the partition of the immense continents of America. There was no apparent reason why she should not participate; her own domains, already of vast extent, were but a step from those of the New World, and her own people were accustomed to the rigorous life of the frozen north. Advancing across the steppes of Siberia, proceeding from river mouth to river mouth, a vast army of Cossack and Russian sable-hunters and explorers gradually forced their way eastward to Kamchatka and the Pacific Coast, and thence to America.

Chirikof and Bering, first of the Russians, landed on the shores of Alaska in 1741. The beautiful furs brought back by the members of the expedition aroused the desire of the traders of Kamchatka and brought about the exploration and colonization of Alaska, for furs meant to Russia what gold and jewels meant to Spain. Bassof, Nevodchikof, Tolstykh, and other traders, trappers, and navigators ventured out in their frail and flimsy craft and aroused Russia to a realization of the wealth of Alaska.

Beginning with the expeditions of individual merchants, the fur trade gradually developed into a monopoly which included governmental control of the new territory. Gregor Ivanovich Shelikof, who began trading in Alaskan furs in 1776, first saw the possibilities in mergers. Effecting partnerships, he evolved the great Shelikof Company which, in 1784, established the first settlement in Alaska.

With two ships, the *Three Saints* and the *St. Simeon*, Shelikof, in August, 1784, reached a bay on the southeastern shore of Kodiak Island where, after a few days spent in exploration and in conflict with the natives, he prepared for the permanent occupation of the island. Within a few weeks the Russian carpenters and laborers had erected dwelling-houses and fortifications, whereupon the settlement received the name Three Saints. An expedition sent from this village in the spring of 1785 succeeded in establishing fortified stations on Cook Inlet and on Afognak Island.

Early in 1786 Shelikof despatched an expedition from Three Saints to erect a fort and establish a settlement at Cape St. Elias, on Kayak Island, while he busied himself nearer at home in abandoning the fort on Cook Inlet and in strengthening the fortified station on Afognak Island. Later in the year the Company established Fort Alexandrovsk near the entrance to Cook Inlet. This was a square fort, with poorly built bastions at two corners, and in it were mounted two guns.

During the same year the Lebedef-Lastochkin Company, a rival of the Shelikof Company, settled a permanent establishment at the mouth of the Kassilof River in Cook Inlet. This settlement, named Fort St. George, consisted of two log buildings protected by a stockade.

In 1788 a Russian redoubt was built at the mouth of the Copper River, a few miles south of Alaganik.

Shelikof established his colony firmly enough, but the company did not expand greatly until Alexander Andreievich Baranof was secured as its resident manager in 1790. At that time the company was in actual possession of the Kodiak Islands and a few of the smaller adjacent isles. Arriving in 1791, Baranof soon decided to remove the headquarters of the company from Three Saints Bay to Pavlovsk Harbor, on the northern side of Kodiak Island, because of the better harbor and the greater supply of timber.

In August, while Baranof was still engaged on Kodiak, another ship belonging to the Lebedef-Lastochkin Company arrived at Cook Inlet, carrying sixty-two Russians under Gregor Konovalof. Proceeding to the mouth of the Kaknu River, twenty miles beyond Fort St. George, and completely ignoring that station, the party landed and undertook the erection of habitations and fortifications, surrounded by a stockade and defended by guns. This fort they named Fort St. Nicholas. At this time the main base of operations for the Lebedef faction was at Fort St. Constantine, on Nuchek Island, consisting of the usual stockade, enclosing dwellings and storehouses. Before long, the Lebedef Company was overtaken by reverses, and these three stations were, within a few years, abandoned by that organization.

In 1792 Baranof visited Cook Inlet, where he strengthened his outlying stations and hastened the work on the fortifications.

In 1796 the Russian government caused a fort to be built on Yakutat Bay, at the mouth of Ankan Creek, for the protection of a colony of exiles assigned to this station by the Czar. Here the settlers led a miserable existence until 1805, when the colony was exterminated by the Indians.

In 1798 the Shelikof Company absorbed a number of traders and became the United American Company. Through a merger effected the following year, this became the Russian-American Fur Company, with a twenty-year monopoly of trade on the northwestern coasts of America.

The time was now ripe to expand, and Baranof immediately proceeded to Sitka Sound, where he landed about six miles north of the present site of Sitka. Purchasing a piece of ground from a Sitkan chieftan, he laid the foundations of Old Sitka in 1800, and on the shores of Sitka Bay he erected his fort which he named Fort St. Michael. This was a two-story structure protected by palisades and by two strong blockhouses or towers.

Returning to Pavlovsk later in the year, Baranof found that the Kodiak Island and Cook Inlet establishments had been broken up. At the Kaknu River station he selected a more convenient site for the fort and left the agent, Malakhof, to superintend the work. After inspecting Fort Alexandrovsk, he visited Fort St. Constantine on Nuchek Island and established that fort also upon a new site.

In May, 1802, while Baranof was absent at Afognak, a party of about six hundred natives attacked Fort St. Michael, at Sitka, drove out the garrison, and

destroyed the fort. All the officers and thirty of the men were killed. The loss of this fort was a serious blow to the Russians, and Baranof naturally yearned for revenge. Not until the spring of 1804, however, was he able to turn his attention to the reoccupation of Sitka.

In the meantime, he improved the situation of the other posts. Besides Fort St. Michael, the Company had at this time twelve stations in operation. On Kodiak Island were Forts Three Saints and Pavlovsk; on Cook Inlet were Forts St. George, St. Paul, and St. Nicholas; in the Chugatsch territory were Fort Constantine on Nuchek Island and a fort at Port Delarof; on Yakutat Bay were two forts; and there were forts on Cape St. Elias, Afognak Island, and Fort Alexandrovsk (or Alezander) on Cape Kenai, at the entrance to Cook Inlet. Most of these forts were armed with three-pounder pivot guns and were, with due precautions, strong enough to resist the attacks of hostile natives.

Arriving at Sitka in September, 1804, Baranof found that the Indians had fortified themselves on a bluff a few miles distant from the old settlement. Their fort was an irregular polygon, facing the sea, with six-foot walls, two logs in thickness. Around and above it was piled tangled brushwood, and there were two embrasures for the service of the two cannon with which it was armed. Two gates faced the forest in the rear.

On the first of October, Baranof opened fire upon the fort from his ships, but without appreciable effect upon the defenses. A landing party thereupon assaulted the works under cover of the fire from the vessels, but the natives sallied and drove the Russians to their boats. The next day the bombardment was resumed, and in the afternoon the Indians sued for peace. Several days were occupied in negotiations, and on the morning of the seventh it was discovered that the natives had evacuated the fort during the night. The Russians thereupon burned the fort to the ground and occupied the site for their new settlement Novo Arkhangelsk, New Archangel.

The construction of buildings was immediately begun, a stockade was erected around the buildings, and blockhouses were built at each corner. By June, eight substantial buildings had been erected and the fort had been completed and the cannon mounted. A few months later Baranof removed his headquarters from Kodiak to New Archangel, which thereafter remained the capital of the province. In 1810 Captain Golovnin, of the sloop-of-war *Diana*, wrote that "In the fort we could see nothing remarkable. It consisted of strong wooden bastions and palisades."

While Baranof was still at New Archangel, an expedition was sent to establish a permanent station in Bristol Bay on the Nushagak River. At the mouth of the river, the party erected a fort which they named Fort Alexandrovsk.

M. N. Mouravief arrived at New Archangel in 1821 as manager and governor, and he at once began to reorganize the garrison and to repair the fortifications of all the settlements.

Upon his arrival in 1833 as governor, Baron Ferdinand P. von Wrangell ordered Lieutenant Michael Tebenkof to proceed to Norton Sound for the

purpose of establishing a settlement. Here, on the southeast side of an island adjacent to the mainland, Tebenkof erected Michaelovski, or Fort St. Michaels, which became the principal station of the Russian-American Company in the north. The station was built on the usual plans with a picket enclosure and with flanking bastions.

In 1833 the Hudson Bay Company conceived the idea of establishing a fort on the Stikine River, and fitted out the brig *Dryad* for that purpose. Wrangell, duly informed of the project, despatched Lieutenant Dionysious Zarembo in the armed brig *Chilkaht* to anticipate the British. On a small peninsula at the mouth of the Stikine, near the site of Wrangell, Zarembo erected a fortified station which he called Fort St. Dionysious and which later became Fort Wrangell. When the unsuspecting *Dryad* arrived, it was greeted by a volley from the shore as well as from the ship in the harbor. Unable to land, the British were forced to return to Fort Vancouver. The incident caused considerable trouble between the two nations, but was settled in 1840 by the payment of an indemnity and by a lease of the land to the Hudson Bay Company. Under the British, the fort became Fort Stikine.

In 1838 Malakof established a blockhouse at Nulato, on the Yukon River, but the garrison returned to Fort St. Michaels for the winter, and during the absence of the Russians, the Indians improved their opportunity by destroying the works. The site was re-occupied and a permanent post established by Lieutenant Zagoskin in 1842. Derabin assisted in the erection of this post, which took the name of Fort Derabin. The buildings of the post formed two sides of the fort and a part of a third, and the remaining parts consisted of a stockade sixteen feet high. Two watch-towers completed the fort, which was armed with a couple of antique 6-pounders.

In 1841 the Russians established a fortified post at the mouth of the Unalakleet River, on Norton Sound. Six years later, McMurray descended the Porcupine River and built Fort Yukon about a mile above the confluence of the Porcupine and the Yukon.

In 1851 the fort at Nulato was surprised by Indians, and most of the inmates were butchered. A new fort, surrounded by a stockade, was built two or three years later. In 1855 Fort Andreiefski, some distance below Nulato, was destroyed by Indians. In the same year an attack upon New Archangel, or Sitka, as it was beginning to be called, was repulsed. By this time the number of cannon in the fort at Sitka had been increased from the fifty of 1817 to about seventy.

At Fort Yukon, the encroaching waters of the strong current had gradually undermined the bank on which the fort was built, so a new fort was begun in 1864. This consisted of four blackhouses or bastions, pierced for musketry, but it was without a stockade, and was still in an unfinished condition when the United States acquired the territory.

At the expiration of the third twenty-year period of the charter to the Russian-American Company, the government and the company were unable to agree on terms for a further extension. Negotiations were thereupon opened

for the sale of the country to the United States, while the company began to make preparations to leave Alaska. Expenses were curtailed, and Nulato and some of the other stations were abandoned. It was, however, not until 1867 that the negotiations were concluded and Alaska sold to the United States for seven million two hundred thousand dollars.

Soon after the cession of Alaska to the United States, General Rosseau proceeded to Sitka to receive formal possession from the representatives of the Czar. On October 18, 1867, Captain Pestchourof ordered the Russian flag lowered; the garrisons presented arms; the guns fired a salute; and the American flag was hoisted. General Rosseau then took immediate possession of the occupied military stations.

Of the many blockhouses, forts, stockades, and fortified stations built by the Russians, there were but few left; most of them had been destroyed by the Indians or abandoned by the Russians. At the mouth of the Stikine River was Fort Wrangell, which had been kept in condition by the British for many years. At Sitka, on Baranof Island, was the strongest fort of them all, known at that time as Sitka Castle. Kodiak Island still had its station, which had become known as Kodiak. Fort Kenai, or Redoubt St. Nicholas, on the Kenai Peninsula, consisted of a high stockade with octagonal bastions at the angles and with an armament of 1½-pounder falconets. Fort St. Michaels, on Norton Sound, still cared for the Yukon trade, and up the river lay the incomplete Fort Yukon. In the military occupation which followed the cession of Alaska, these stations became part of the defenses of the only colony then possessed by the United States.

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The primary object of this type of military training is not to make soldiers, but to use some of the elements of soldiership in fitting our boys for the work of life. . . . One parent writes: "From my own personal observation of some twelve or fifteen boys who had grown up in this neighborhood, I find that the boys who have been taking military drill regularly are better physically and have that poise and mental control necessary to modern business life." Father Cullen says: "For seventeen years we have had a military organization at St. Thomas College. Its benefits to the students, both physically and mentally, are, in our experience, undoubted. Young men come to us awkward in gait, stooped in shoulders, and in-alert. In the course of one semester they acquire an agility of step, and a straightness of stature that shall constitute for them a valuable asset in whatever vocation they may enter."—Rev. Marion D. Shutter.

Activities of Anti-War Societies

By Capt. A. W. Waldron, C. A. C.

EVERY great nation that the world has ever known has been built on two marked characteristics of its people—national loyalty and true patriotism.

Until within the last ten or fifteen years there has always been a marked loyalty on the part of the people of the United States. Each generation as it came to take the reins of government was instilled with patriotism, and American ideals and institutions were cherished and defended.

But during the recent World War we found a growing attitude to oppose the Government, to prevent efficiency in war preparation, and to hinder its activities when our soldiers began to go overseas. This was evidenced by the endeavor to inject into the minds of the people at large certain peculiar ideas as to the reasons and causes of the conflict and to urge a settlement that would practically be a surrender on the part of the United States.

Since the close of the World War there have sprung up many anti-war or pacifist organizations having for their purpose "disarmament and universal peace."

This movement is by no means new as peace societies have existed for many years. The modern peace movement had its beginning about the year 1815. In that year three so-called Peace Societies were organized, the strongest of which, The Peace Society of London, is still in existence. From that time on, organization was rapid until 1828 when, it is recorded, there were twenty peace societies in the United States alone and the movement had extended to England, France, Ireland, and Canada.

There has been compiled by the National Council for the Prevention of War a list of eighty-seven outstanding organizations active in the Peace Movement today. These are well founded along corporation lines, installed in well equipped offices with boards of directors, salaried officers, and memberships ranging from twenty-five million (estimated as that of the Federal Council of Churches of Christ in America) to a few hundred. These societies exist by voluntary contribution, by membership fees, by endowment from such funds as the Carnegie Endowment for International Peace and the Garland Fund, and by the small fees collected for their periodical publications.

It is not the intention of this discussion to intimate that all the organizations active in the peace movement are a menace to our constituted government. Many are sincere advocates of World Peace and their endeavors are commendable. It is, however, in the radical group of professional propogandists where the real danger lies and to combat which many patriotic organizations are active. Such patriotic organizations include the Daughters of the American Revolution, The American Legion, Veterans of the World War, and the National Security League.

The subject of the activities of the anti-war societies will be taken up under four main heads, namely:

1. Professional propaganda.
2. Religion.
3. Education.
4. Politics and industry.

Professional Anti-war Propaganda.

The many anti-war societies which have sprung up in this country since the armistice vary greatly in character, composition, and size, but their dominant force in leadership rests on the individual of the professional propaganda type. Some of these organizations, and with them the individual leaders, are devoted solely and sincerely to the cause of peace among nations, while the extreme groups have aims closely paralleling those of the communist and in many cases seem to be the medium for the advancement of radical ideas.

The largest and most powerful group of this kind is the National Council for the Prevention of War, which was organized in 1921 under the name of the National Council for the Limitation of Armaments. The name was later changed to The National Council for the Reduction of Armaments and still later to its present name. It claims to have twenty-eight participating and seven cooperating organizations, representing a membership of approximately ten million men and women, and spreads its propaganda through a bulletin which has a circulation of over fifteen thousand. The Council states that it has three objectives: 1st, Progressive World Organization; 2nd, World Wide Reduction of Armaments by International Agreement; and 3rd, World Wide Education for Peace. It is a clearing house of national organizations indorsing the Limitation of Armaments whose aims are disarmament, outlawry of war, abolition of the National Guard, and Internationalism. Of their methods employed in spreading their propaganda I quote a circular letter.

> During the past year we furnished speakers for 500 meetings, circulated thousands of letters on the World Court helping to take it out of the files of the Senate and make it a prime issue before the people, carried on far-reaching educational campaigns through women's organizations, churches and schools to substitute peace and good will in place of war and egotism in international relations; issued special studies on the development of the military establishment and conducted nation wide demonstrations of government action on the substitution of law for war.

At the head of this Council is a professional propagandist, who shapes its policies and puts them into effect. Their leader has indicated in his writings and speeches that his sympathies are with Soviet Russia and Communism.

This anti-war movement is well organized and works for a common objective, whereas the patriotic organizations and individuals combatting its influence work independently. Its influence on the Regular Army, Navy, and Marine Corps is apparently negligible at the present time, but in the event of war its effect might be felt in an increased number of conscientious objectors and efforts to block government action.

Anti-war Religious Societies.

Pacifism among the different religious denominations of the country find their principal means of expression through the Federal Council of Churches of Christ in America and the Church Peace Union.

The latter comprises all denominations; Protestant, Catholic, and Jewish. It has a $2,000,000 fund donated by Andrew Carnegie, separate and distinct from the $10,000,000 fund mentioned, and is an active force for pacifism.

The Federal Council of Churches of Christ in America was founded to give united expression to the common religious ends of the various Protestant organizations. At the present time it represents thirty religious bodies, with a membership of about twenty-five million.

The work of this council is carried on through various commissions, the principal and strongest being the Commission on International Justice and Good Will which is working to better international relations.

The view of the Federal Council in relation to war is summarized about as follows:

1. War should be outlawed.
2. Instead of war, substitute the World Court and Boards of Arbitration.
3. The World War came because Christian sentiment against it was not aroused in time to prevent it.
4. The post-war period is a period of grace of which full advantage should be taken to substitute peaceful processes for war and to eradicate from human nature the belief of the efficacy of war and of preparedness.

A study of the policies, methods, and tactics of all the religious groups of anti-war societies shows that their purposes differ very little as regards fundamentals and may be summarized about as follows:

1. To organize with foreign organizations of a like nature to develop pacifism and a belief in the uselessness and sinfullness of war.
2. To use this influence to reduce armaments and ultimately to abolish armed forces throughout the world.

The methods of these societies are all very much the same. They attack military forces from the pulpits, in daily papers, and in special publications. They preach that all war is sinful and therefore unjust and unnecessary. They appear to advocate fear and non-resistance and at the same time to appeal to the highest ideals and the basest human traits. They employ professional reformers and agitators as well as scholars and clergymen to spred their subversive and subtle propaganda.

This subversive movement for the reduction of armaments and the abolishment of all armed forces has a very sinister aspect when it is realized that such a policy coincides with the fundamentals of communism.

Radical organizations seem to find a bond of sympathy in the Churches which is hard to understand when we realize that the American Socialist Party claims that ninety-nine per cent of its members are atheists. It appears that many clergymen are affiliating with socialism in opening their pulpits and

church forums to radical agitators who are paid representatives of European revolutionary bodies. This is no doubt due to the mistaken idea of a short cut to spread the doctrine of the sinfulness of war. It certainly has the sinister aspect of sewing seeds of unrest and class distinction among a sincere, devout, and important part of our people. The only way to combat this influence is through a realization of the primary law of nature, self-preservation, and the full knowledge of the destructive results which are bound to follow from the radical teachings of pacifism.

Education.

Prior to 1914 radicalism, as represented by the anarchist and the socialist, was not a serious factor in this country. Since the World War, however, due largely to the success of communism in Russia and to the propaganda of the Third Internationale, the radical and pacifist movements have grown so that at present there are more than two hundred organizations in the country actively engaged in or in sympathy with the revolutionary and pacifist activities of the Communist Party of America, which is the strongest and most active of the radical organizations of the United States.

A large group of these radical anti-war and pacifist societies are working in our schools and colleges and maintain contact with the Executive Committee of the Communist Party of America or the Workers' Party of America, which organizations in turn interlock with the Third Internationale, the Red Trade Labor Union Internationale, and the government of the Federated Soviet Republic at Moscow.

This propaganda work of the pacifist and anti-war groups is preached and taught through such societies as the National Student Forum, the Young Peoples Socialistic League, and the so-called Youth Movement. The National Student Forum claims to be in contact with 250,000 students and has direct contact with radical clubs in dozens of institutions.

The Young People's Socialistic League, or "Yipsols," work in the public schools. This society teaches the doctrine of the Third Internationale and is affiliated with the Communist Party. It has a membership in New York City alone of several thousand, sixty per cent of whom are in the public schools and the remainder attending part time schools.

A leader of the Youth Movement recently stated at a conference of several of these radical societies that all plans had been made to spread this movement throughout the United States by means of the impressional youth in the schools. We may readily see how dangerous this is when we realize that such a movement advocates the abolishing of Christianity, government, property rights, the family, and all color lines. Communists are among the teachers in the public schools of all our large cities. Their purpose is stated by a Boston teacher, who says: "Give us one generation of small children to train to manhood and womanhood and we will set up the Bolshevist form of Soviet Government."

Pacifist propaganda as carried on through the schools aims at the destruction of our American nationalism. A careful study into the activities of these

pacifists show that since 1914 they have been pro-German, pro-peace at any cost, pro-disarmament, pro-pacifist, and finally pro-communist.

Now a final point on the educational aspect of the Educational Pacifist and one of vital importance to the country at large. This is the Anti-R. O. T. C. campaign. This movement is without a doubt a radical Communist effort, in which the Church is made a cat's-paw, by reason of its peace sentiment to abolish all military training in all of our educational institutions except West Point.

As a part of this plan and as an entering wedge there appeared the so-called Lane Pamphlet under the auspices of the Committee on Military Education which had a wide circulation through the financial backing of the Garland fund.

This pamphlet was based on the following assertions:

1. That the R. O. T. C. is a rapidly growing, sinister organization foisted by Congress on the country.

2. That it is against the ideals of peace.

3. That military training is against the development of independent thinking so necessary in our colleges.

4. That it will "militarize the country."

While stating facts regarding the R. O. T. C. that are true in themselves, it so distorts them as to lead the reader to believe that it is a bad institution.

It attacks the R. O. T. C. administration, gives the opinion of hostile educators on its value, and suggests that its graduates will constitute a formidable "Officers' Class" which will lord it over the unorganized man power of the country and will make for serious international complications. It then goes on to outline how easily the system may be broken down.

That the sponsors of this movement are well organized is evidenced by the fact that a bill was introduced in the 69th Congress for "the Abolishment of Compulsory Military Training at Schools and Colleges."

That the country at large is still fundamentally sound as regards the National Defense Act, however, is evidenced by the fact that, although this campaign was at its height during the college year 1926-27, only two colleges changed their system of R. O. T. C. training from compulsory to voluntary.

Politics and Industry.

Coming now to the political and industrial aspect of the anti-war movement we may well include under this head the Radical, or Red, element in this country and call it a Revolutionary Movement, which in effect it really is.

Radicalism, Socialism, Bolshevism, and Anarchism are among the leading questions of today. These movements are international in character and, starting in Europe, have spread not only to this country but all over the world.

The outstanding radical organization is the Communist or Third Internationale. It is the outcome of the First Internationale, which was organized in London in 1864. This was a socialist organization having for its object the organization of the workers of all countries. Bitter feuds broke out and the workers were divided more than ever. It was succeeded by the Second Internationale in 1889 and by the Third Internationale, or Communists, in 1919.

Bolshevism, Communism, and Socialism are practically the same thing, as Bolshevism and Communism are in reality only Socialism in action. The extreme group of this character are the anarchists who believe in liberty unrestricted by man-made laws. The Socialist Group is at work to destroy our present form of capitalist government and the establishment of a cooperative commonwealth. The ballot is their principal weapon. During the World War they actively opposed the government. Following our declaration of war the Socialist Party announced its policy as follows: "The Party solomnly affirms its allegiance to the principles of Internationalism and proclaims its unalterable opposition to the war just declared by the Government of the United States." It openly called on the workers of the country and its members to refuse to support the government and referred to national patriotism as a false doctrine.

Now let us see what the Socialist Party has led to. The Communist Party was organized from the so-called "left wing section" which was expelled from the Socialist Party on account of its extreme radical theories. From the Communist Party the Communist Labor Party was organized and the time was now ripe for Russia Soviet to get busy. Accordingly, the United Communist Party was formed. This is an underground, illegal organization and advocates all the principles of the Communist Internationale.

Legal parties were formed which could work in the open. They are the Worker's Party of America, the Trade Union Educational Alliance, and the Friends of Soviet Russia. All are directly controlled by the Communist Party.

The principal organizations of the industrial type are the Industrial Workers of the World and the Workers' International Union. The principal strength of the first is in the West and middle West among the miners and labor camps. They advocate direct action, stand firmly for internationalism, and recognize no country. Many different means and arguments are used to spread their propaganda. Newspapers and periodicals are printed in many different languages and agitation and speeches are used with great effect, especially among the foreigners.

The influence of these radical groups being well known and the methods pursued in the suppression of their activities having greatly lessened their activities, with the return of normal post-war conditions it is believed that they will not constitute a serious menace to our government.

SUMMARY AND CONCLUSION

It is believed that:

1. A well organized effort is being made by certain anti-war societies to break down our national system of defense.

2. That the effect of such efforts are negligible in the Regular Service but will be noticed in an increase of conscientious objectors in the next drafted army and in the placing of obstacles in the way of government action.

3. That the activities of anti-war societies sow seeds of unrest and class

distinction in what might prove to be a very fertile field, a sincere, devout and important part of our people, through religious pacifism.

4. That the affiliation of anti-war societies and Communism or Internationals is unnatural.

5. That the most dangerous phase of radical anti-war activities is the attempt to advance the doctrines of Communism and Internationalism through the schools and colleges of the country.

6. That a coordinated and sustained effort should be made to educate our people as to the purpose of our national defense program and to break down decisively pacifist propaganda.

7. That the methods and organization of the Socialist Group being well known it is believed that they are not new, nor will be later, a menace to the organized government of the United States.

8. That in general the only real effect these anti-war societies can have on the nation at large are the causing of industrial unrest during economic crises and the undermining of the American youth through subversive teachings during their tender years.

Let us respect it as a sane man respects his insurance. There need be no fears of its excessive cost. The total budgets for national defense are far less than the budgets for many of the minor luxuries of life. We spend more for chewing gum and candy than we do for the Army and Navy together—less for national defense than for jewelry, perfume, and adornment. Our police force costs more than our national defense.—Secretary of War John W. Weeks.

History of Battery C, 65th Coast Artillery

By Captain B. L. Milburn, C. A. C.

BATTERY C, 65th Coast Artillery is a combination Gun and Machine-Gun Battery. It was organized as a part of the 65th Coast Artillery (AA) on June 30, 1924, in accordance with G. O. No. 17, Hq. Panama Canal Department, 1924, the enlisted and commissioned personnel being transferred from the 15th Company, C. A. C., Fort Randolph, C. Z. Battery C was formerly the 2nd Company, C. A. C., organized June 1, 1917, per Mimeograph Letter, Hq. Panama C. A. District, May 21, 1917, and par. 1, G. O. No. 3, Hq. C. D. of Cristobal, 1917. On August 31, 1917, the designation was changed from 2nd Company, C. A. C., to 8th Company, Cristobal, per par. 7, G. O. No. 98, W. D., 1917, and S. O. No. 10, Hq. C. D. of Cristobal, Sept. 25, 1917. On June 30, 1922, the designation was changed from 8th Company, Cristobal, to 194th Company, C. A. C.

Battery C is now assigned to the following armament:

Battery No. 3, four 3-inch antiaircraft guns
Battery No. 6, three 3-inch antiaircraft guns
Battery No. 7, three 3-inch antiaircraft guns
Twelve .30-cal. machine guns
Two 14-inch guns.

Of the above armament, only Battery No. 3 and the machine guns are in service.

Battery C has a record of which any organization may well be proud. Its lineage is not particularly impressive but its modern achievements are noteworthy. For the training year May 1, 1927, to April 30, 1928, the following accomplishments are of record:

a. Excelled all other antiaircraft batteries in the Canal Zone in annual machine-gun practice at aerial targets, with an average score of 244.75. This was also a higher average score than any antiaircraft machine-gun battery in the Coast Artillery. (Battery C, being a combination gun and machine-gun battery, competes against all separate gun and machine-gun batteries in the United States and foreign possessions.) Awarded the Regimental Commander's trophy for the best record in machine-gun firing (par. 3, G. O. No. 5, Hq. A. A. Def. of C. Z., 1928).

b. Excelled all other antiaircraft batteries in the Canal Zone in annual 3-inch gun practice at aerial targets, with an average score of 130.75. This was the second highest score made in gun firings in the Coast Artillery Corps. Awarded the Department Commander's trophy for the best 3-inch gun firing (G. O. No. 17, Hq. Panama Canal Department, 1928). The trophy was presented by the District Commander on June 19, 1928.

c. Awarded an "Excellent" rating by the Chief of Coast Artillery, which entitles the members of Battery C to wear the red embroidered "E" until the next training year.

d. Complimented by the Regimental Commander on the showing made by the Battery on the occasion of the District Commander's annual armament inspection, with the following remarks:

> "The condition of Battery No. 3 was as good as that of any Battery I have ever seen and your machine guns could scarcely have been improved upon" (Letter April 19, 1928, File 333.1).

e. Awarded the District Commander's Cup for the best all-around battery in the Panama Coast Artillery District (G. O. No. 1, Hq. Panama Coast Artillery District, May 23, 1928). The Cup was presented by the District Commander on November 9, 1928.

f. Announced as winner of the Knox Trophy for the training year 1927-1928. The Knox Trophy is donated annually by the Society of the Sons of the Revolution in the Commonwealth of Massachusetts "to that Battery of Coast Artillery which attains the best results in target practice and gunnery." The award is made on recommendation of the Chief of Coast Artillery. The Battery Commander, was ordered to Boston, Massachusetts, to receive the trophy and attend the presentation ceremonies and banquet of the Society on January 17, 1929. In forwarding the announcement of the award to Battery C, the District Commander remarked as follows:

> "The District Commander feels that the award of this trophy reflects great credit upon you, your officers, and enlisted men of Battery C. All personnel of the District, he feels sure, will join him in expressing to you congratulations on this well deserved honor. It is a result of a high degree of training, hard work and loyal cooperation of all concerned." (Letter 332, November 17, 1928.)

The following accomplishments are of record for the training year May 1, 1928, to April 30, 1929:

a. Qualified 96.8% of the personnel of the Battery in small-arms practice. This is one of the best records in the Canal Zone.

b. Excelled all other antiaircraft batteries in the Panama C. A. Distict in the annual machine-gun target practice at aerial targets, with an average score of 230. Awarded the Regimental Commander's trophy for second successive year for this firing (G. O. No. 6, Hq. A. A. Def. of. C. Z., Sept. 1, 1928). The trophy was presented by the Regimental Commander on Sept. 18, 1928.

c. Made the highest average score (133.4) in annual antiaircraft gun practice at aerial targets. The winner of the Department Commander's trophy for this firing has not as yet been announced. Due to continued rain and inability of the Air Corps to furnish additional towing missions only two record practices out of four were held.

The accomplishments of Battery C in athletics has kept pace with its training accomplishments.

a. In the December, 1927, Department Championship Boxing bouts the battery was represented by one of the eight members of the Atlantic side team, Private Twigg. Corporal Lloyd, of the battery, also won in the Atlantic Side semi-finals but did not enter the Department finals. In the 1928 championship bouts the battery was represented by Corporal Lloyd and Private Jarvis.

b. The Harbor Defense baseball team was represented by the following members of Battery C: Corporal Lloyd, leading pitcher; Sergeant Lyons, regular shortstop, and Private Brewer, utility out fielder. The battery is represented on the 1928-1929 squad by Sergeants Lyons and Hayes and Corporal Lloyd.

c. The battery won the Post Basketball Championship in May, 1928. The Cup was presented by the Post Commander on July 17, 1928. The following members of this team were placed on the Post Squad: Sergeant Lyons, Corporals Lloyd and Snyder, Privates Leatherman and Slattery.

d. Corporal Waddell is a member of the Harbor Defense swimming team which competed in the Department meet in December, 1928.

e. The following members of the battery are on the Post Track Team which competed in the Department meet in December: Sergeant Lyons, Sergeant Simmons, Corporal Snyder, Privates Wolfred, Price, Hicks, Roush, and Ritchie. Battery C has won the last two field meets at Fort Randolph.

f. While there has never been a Post Volley Ball league, the Battery C team has always been considered the best at Fort Randolph. Battery C is the only battery from the Post which entered a Volley Ball team in the Y. M. C. A. tournament last year. Three members of the team, Sergeants Simmons and Appleman and Private Mulholland, were selected for the Atlantic Side Team for the Canal Zone Tournament.

In small-arms training, both coaches and individuals enter into a spirited competition to secure favorable scores. Every man enters record practice with the idea of doing his best for the sake of the battery. Liberal prizes are awarded for individual effort. At the conclusion of the last small-arms practice, each man who qualified received a carton of cigarettes. Cash and cigarettes for highest and second highest scores, standing, prone, etc., at various ranges and for greatest improvements over scores of the previous year were awarded.

In miscellaneous training such as First Aid, Hygiene, Guard Duty, Identification of Aircraft, etc., a special effort is made to arouse interest and make the subject attractive. In Identification of Aircraft, for example (an important phase of training for antiaircraft troops), silhouettes of airplanes of all types, classes, and countries are pasted on a large chart and differences in design and appearance pointed out. This remains in the day room for men to study and discuss during off-duty hours. Trips are made to the nearest flying field to view ships at first hand and the men are encouraged to identify and discuss the features of the planes seen in the air from time to time. During rest periods at Infantry Drill or other formations men are called upon to identify and describe

planes seen in the air. In the above manner interest is stimulated and men can readily and immediately identify planes from silhouettes, charts, or still picture slides on a movie screen.

In 3-inch gun practice the importance of the individual in the ultimate goal of "hits per gun per minute" is stressed. The fact that one man, a fuze setter for example, may ruin a practice by making a mistake, though all other details in both the range section and the gun section function perfectly, is emphasized. Most of the preliminary shooting, and during the last season, one record practice, were fired by individual guns. This provided an excellent opportunity to correct mistakes and stimulate competition between sections. A record of time and hits by sections was kept and posted on the bulletin board daily. Intense rivalry existed between the three gun sections. At first, Sergeant Kelso's section (No. 2) seemed to have the best time, Corporal Moore's (No. 3) the most hits (with relatively slow time), and Sergeant Oliver's (No. 1) most nearly approaching the ideal of "hits per gun per minute." In the end all sections approached that ideal satisfactorily.

There was similar competition in the machine-gun firing. Among the thirty men who fired the individual courses there was keen rivalry in determining the eight men to be used as gunners in the record firing. Those finally selected were Corporals Waddell and Snyder, Privates Szczepura, Wolfred, Reed, Elliott, Leatherman, and Bonzo. Two men, Privates Leatherman and Reed were lost to the section before the completion of the firing. Their places were taken by Privates McGuire and Nichols. Sergeant Simmons was Chief of Section and Second Lieutenant Donald H. Smith the Platoon Commander.

For the night machine-gun firing the men were often kept out at the firing point until late hours. When they returned to barracks sandwiches were served as a means of maintaining the excellent morale that existed during the entire firing. For some time C Battery has had a reputation of having a fine mess. To have such a mess has been recognized as a separate training objective for it is closely allied to battle efficiency.

There is much enthusiasm on the part of the Machine-Gun Platoon with reference to next year's practice. The machine-gun trophy has been won by C Battery for two consecutive years and it becomes a permanent possession of the battery if won next year. Several of the best gunners who are due to return before next year's practice have indicated a desire to have their tours of foreign service extended in order that they may help win permanent possession of the cup. This is only another indication of the fine spirit that exists in C Battery.

PROFESSIONAL NOTES

Target Practice

The gunnery problems with which we are confronted today are those which we had to meet yesterday and which will be with us tomorrow. We need more hits-per-guns-per-minute. However much we may advance in position finding, fire control, and gunnery and however much we may improve materiel and extend range, our one object will always be hitting ability.

Progress is being made, but many of us fail to appreciate fully the advance of recent years in all lines of target practice. Readers of the JOURNAL may therefore find it interesting to look back and see what was being done twenty years ago during a period of marked advance. For this reason, the following extracts from the annual reports of the Chief of Coast Artillery for 1910 and 1911 are reprinted.

ANNUAL REPORT OF CHIEF OF COAST ARTILLERY (1910)

The improvement in target practice in 1909 over 1908 with each type of heavy gun and mortar battery was marked. The same targets, except for 5-inch and 4.7-inch guns, as indicated below, were used for both years. These targets were: For heavy guns, a 30 by 60 foot hypothetical target; for rapid-fire guns, a 10 by 24 foot materiel target; for mortars, a hypothetical target having a diameter of 100 yards. (Note.—Five-inch and 4.7-inch guns used 10 by 24 foot targets in 1908 and 30 by 60 foot targets in 1909.) The ranges were—

	1908	1909
Guns:	*Yards*	*Yards*
Primary armament	5,000-9,000	4,000-10,000
Intermediate and secondary armament	1,000-6,000	1,500- 5,000
Mortars	3,000-9,000	3,000- 9,000

The increase in mean percentage of hits in 1909 over 1908 with each caliber of gun and mortar is as follows:

12-inch mortars	6.4
12-inch guns	22.2
10-inch guns	13.5
8-inch guns	27.6
6-inch guns	24.2
5-inch guns	44.6
4.7-inch guns	43.0
4-inch guns	18.2
3-inch guns	10.5

As will be seen from the above, the mean percentage of hits for 1909 with all guns and mortars show consistent improvement over the previous year. The following individual records made with guns and mortars in 1909 are especially noteworthy:

Mortars—At Fort Howard, Md., in August, 1909, the Twenty-first and One hundred and third companies, Coast Artillery Corps, manning a battery of 12-inch mortars, made 8 hits out of 14 shots in seven minutes and thirty seconds. In this practice 1.07 hits per minute were made, which is the highest rate of hitting that has yet been attained by a mortar battery. In the best mortar practice for 1908, 0.881 hits per minute were made. This improvement not only in best records, but the consistent improvement with our mortars, is very gratifying. These records are made by firing one mortar at a time. As stated in my last report, it is contemplated to fire mortars in service in groups of 4 or 8, so that the hits per minute which are now being made in practice should be greatly multiplied. The

accuracy of mortars at long range, and their moral effect on an enemy, will undoubtedly deter the most zealous enemy from approaching our fortifications except in case of direst necessity.

Heavy guns.—The most remarkable score which has yet been made by heavy guns was made by the Eighteenth Company, Coast Artillery Corps, at Fort Hancock, N. J., in September, 1909. This company, manning 10-inch rifles on disappearing carriages, fired four shots at a moving material target 30 feet high by 60 feet feet long at a range of almost 7000 yards, or 4 miles from the battery. All four shots struck the material target, actually passing through a rectangle 24 feet high by 53 feet long. The four shots were fired in a total elapsed time of less than one minute, the battery scoring slightly over two hits per gun per minute.

Another exceptionally good record with 10-inch rifles on disappearing carriages was made by the One hundred and fifteenth Company, Coast Artillery Corps, at Fort Rosecrans, Cal., in October, 1909. Four shots were fired at a moving target 30 feet high by 60 feet long at a range of about 9000 yards, or 5 miles from the battery. Three of the four shots scored hits, all four shots passing through a rectangle 9 feet high by 45 feet wide. One of the shots passed 4 yards to the left of the target. The four shots were fired in a total elapsed time of one minute and twenty seconds, the battery scoring 1.13 hits per gun per minute. Each shot splashed water over the target.

In accordance with the plan referred to in my last annual report, night firing was held in 1909 by six companies of the Coast Artillery Corps assigned to rapid-fire guns. The firing was held in six harbors where the shipping at night was so little as to permit the firing to be held with safety. The results of this first attempt at night firing was very satisfactory. The scores, except in one case, were low, but the feasibility of such firing was demonstrated. One company made 75 per cent of hits, and although the rate of firing was slow the record is considered exceptionally good for night work. The Ordnance Department is now taking steps to secure satisfactory shell tracers, and as soon as these are provided night practice will be continued in all harbors where it can be held safely. It is hoped to extend this firing to include, eventually, all heavy caliber guns.

As stated in my last annual report, rules and regulations governing target practice are now drawn with a view to making the study of gunnery and target practice progressive. In 1909 all companies assigned to 8-inch, 10-inch, and 12-inch guns, with four exceptions, qualified at short range for advancement to long range, so that practically all heavy gun batteries are having practice this year at long range. The fact that practically *all* heavy gun batteries have qualified at short range shows that our personnel assigned to these guns can now hit at short ranges. It is the plan to advance to long ranges and fire there until our companies can, on the average, do satisfactory work at these ranges. In accordance with this policy of making the study of gunnery and target practice progressive, therefore, it is hoped that in the near future fire and battle command practice will be held at short and long ranges under war conditions as nearly as it is possible to simulate them.

The improvement in target practice with the guns and mortars in the last few years has been consistent, showing a steady advance toward a maximum of efficiency in target practice. As the target practice improves, the requirements as to conditions affecting practice are made more difficult. For example, this year (1910), for the first time, practically all practice with heavy guns (8-inch, 10-inch, and 12-inch) is beyond 7000 yards, or 4 miles, and only actual hits made on a 30 by 60 foot screen are counted. Heretofore, ranges have been shorter and hits have been counted on a hypothetical target. It is to be expected, then, that improvement in practice as evidenced by mean percentage of hits may not be as marked in the future as it has been in the past. Knowledge of gunnery and ability to hit is, however, advancing steadily, and the interest and enthusiasm of officers and men in target practice encourages a healthy spirit in the Coast Artillery Corps.

Annual Report of Chief of Coast Artillery (1911)

Target practice for the year 1910 was very satisfactory. No accurate comparison of the percentage of hits with heavy guns can be made with the year 1909, because in that year a hypothetical target was used while in 1910 a material target was used. The ranges for 1910 were greater than those fired at in 1909. Practically all of the practices with the heavy guns for 1910 were held between 7,000 and 10,000 yards, the mean range being about 8000 yards. A few practices were held with 10-inch and 12-inch guns at ranges greater than 10,000 yards. The mean ranges for 1909 were from about 5000 to 6000 yards. In 1909 half the practices were held at short range (4000 yards to 5000 yards), while the other half were held at long range (minimum of 7000 yards). The percentages of hits in 1910 were greater than the probability of hitting at the ranges at which the firing was held. Although a relatively small percentage of hits was scored on the small 30 by 60 foot material target at extreme ranges, the accuracy of the practices was remarkably good, and had battleship targets been fired at practically every shot would have hit, as there was little or no wild shooting. Ranges are increasing every year, and it is hoped next year to have all practices with heavy guns at extreme ranges, at least up to 12,000 yards.

The mortars showed continued improvement over last year, and two records of 9 hits out of 10 shots were made on a moving target. In one of these practices 10 shots were fired in 9 minutes 53 seconds; in the other the time for 10 shots was 10 minutes.

Excellent work was done with the heavy guns at Manila in night firing. These guns fired at long ranges, and one case of night firing is reported during 1910 in which 3 hits were made out of 4 shots at about 5000 yards range with 12-inch rifles. A recent report of night firing with 12-inch guns at Fort Mills, Corregidor Island, has been received, which shows that 4 hits were made out of 6 shots on a material target with 30 by 60 foot screen, which was moving at the rate of 8½ miles per hour at a range of about 4¼ miles from the battery firing.

Battery G 241st Artillery, C. A. (H. D.) Mass. National Guard

Regimental Insignia

241st Coast Artillery (Harbor Defense)

The Regiment was known as the "Roxbury Artillery" in the Revolutionary War. On the insignia it is represented by the arm and saber on a field of artillery red.

It was called the "First Massachusetts Volunteer Infantry" in the Civil War, and is represented by the white diamond on the blue background.

In the World War the Regiment was known as the "55th Artillery, C. A. C." It is represented on the insignia by the falcon on the mount (Montfaucon) on a red background.

The Regimental motto, *Vigilantia,* means watchfulness, being alert.

Historical Sketch

Due to a wave of pacifism at the close of the Revolutionary War, the entire Continental Army was disbanded by Congress in 1783. Battery F, 3rd Field Artillery, which was guarding stores at West Point, and commanded by Alexander Hamilton was overlooked.

On May 11, 1787, Governor Bowdoin submitted to his council the petition of Thomas Adams and fifty-three others that gave Battery G, then known as the "Boston Fusiliers," its original charter at Bunker Hill, July 4th, 1787. The Company held its first parade in the morning and was invited to dinner by John Hancock.

Colonel William Turner, the first commander, his officers and the men of the Company had, with few exceptions, fought in the Revolution. The Boston Fusiliers, armed with the fusil piece, was an Infantry unit, and the first to be organized in the United States. Its members represented the best families of Boston. The uniform adopted was that of the British; a brilliant red coat, blue trousers, and shako headpiece.

It did parade and escort duty for the reception to General George Washington in October, 1787, and at the funeral of Governor Hancock, October, 1793. It participated in the ceremonies of laying the corner-stone of the State House in the Hancock pasture, July 4, 1795, being the sole escort to Governor Samuel Adams. Later, in June, 1825, the Company was present at General Lafayette's reception at the laying of the corner-stone of Bunker Hill monument.

The Boston Fusilier Company served in many civil and military events from Shay's insurrection to the World War in 1918, including the War of 1812, Mexican War, Civil War (furnishing 150 officers and 450 enlisted men, taking part in 14 battles), and the Spanish War. During the World War it was known as Battery F, 55th Artillery, Coast Artillery Corps, and engaged in the following battles: Arcis le Ponsart, Second Marne, Argonne, Montfaucon, Gesnes, and Beaufort. It is replete with tradition, and has given to the Army four generals, seven colonels, and many men who have brought conspicuous honor upon the Company.

In its one hundred and forty-one years' existence there have been twenty-nine commanders. Originally known as the "Fusiliers," later the "Hancock Light Infantry," and today, firing 12-inch breech-loading mortars, it is known as "Battery G, 241st Coast Artillery (Harbor Defense)."

A New Administration and a New War

Mr. Hoover had just stepped over the White House threshold when events compelled him to recognize that he had a war on his hands. The troops on the border probably will prevent it from drifting actually into American territory, but if a part of the American army were not in Texas it certainly would do so. For one thing, the discrimination against the rebels would lead to retaliation on Texas towns. Villa did that for just such a reason.

The sounds of the pacifist lobbies in Washington had hardly died down with the adjournment of congress when this happened. These lobbies were hopefully observing the inauguration and preparing for a renewal of their work under a new administration when a President not twenty-four hours in office was dealing with questions of war and was making the United States an intervening force in the war to serve necessary purposes of its own. It couldn't be avoided. The questions were there and they involved the United States.

It was the same old thing. Experience had prepared for it. The event forced it. It made foolishness of the illusions and the wishful thinking. It will not have any impressiveness or meaning for the pacifists and clerics, but the first fact of the Hoover administration was a war. It may turn out not to be a big one, and if the United States is lucky it may not have a great deal more to do with it, but there it is.—*Chicago Daily Tribune.*

Those Who Know War Want Peace

It is significant that the American Legion and other bodies of men who have been in war and know from experience the horrors it brings in its wake, take the rational attitude that the best way to preserve peace is to maintain proper defensive forces. Americans who entered the World War, whether they took part in battle or did not get beyond the concentration camps, know the awful penalties of unpreparedness. They know that if this country had prepared for what was plainly possible from the beginning of the European conflict and ultimately proved inevitable, there would have been tremendous saving of life and suffering and treasure. They know that a great, rich country, inadequately guarded, invites war, while such a country, with adequate defenses, is in a position to discourage aggression and, failing to prevent it, to protect itself and keep its losses to the minimum. It is an anomaly that those who preach unpreparedness as a way to peace are mostly those who have had no personal contact with war.—*Kansas City Times.*

Radio and Aviation

By C. J. Pannill,

Vice President and General Manager, Radiomarine Corporation of America

A new day is dawning in aviation. Out of the welter of experimentation and spectacular stunt flying, there is emerging a concrete and practical ideal which is steadily gaining momentum—that ideal is feasible commercial aviation. If, however, the airplane is to be utilized for the practical transportation of passengers and cargoes, it is necessary to consider the ways and means of nullifying or eliminating, as far as possible, the risks attendant upon flying.

Without question, the most important measure of safety is a satisfactory and reliable signaling system. It is a matter of record that the railroads would never have become the highly efficient transportation agency that it is today, without the elaborate signaling systems which they have developed. With aviation, it must be much the same story if this latest means of transportation is to live up to the golden promises which it now holds forth.

The aviator must know weather conditions in advance, so that he may avoid dangerous flying conditions. He must keep in constant touch with flying fields along his route. He is often compelled to wing his way through impenetrable fogs and darkness, dependent solely upon radio beacons for some knowledge of his position. He must frequently replenish his supply of fuel and oil. Finally, it may not be so much a question of reassuring the aviator, for he knows the risks of flying; but that of gaining public confidence and support, if commercial flying is to succeed, and this depends mainly on proved safety.

To the public, safety and radio are almost synonymous. That radio must be included in the equipment of the commercial aircraft of the future is a foregone conclusion. Realizing this, our flying fields, our communications organizations, our private enterprises interested in the promotion of aviation, and our Government are beginning to take steps to insure the safety of air transportation. On every hand ground facilities necessary to maintain contact with aircraft are being provided. In particular, the Government has inaugurated an elaborate system of radio beacons along our main airways, as well as arranged for supplying weather reports and other pertinent information to airmen via radio telephone stations. However, all these ground preparations are as nothing if proper radio equipment is not carried by airplanes and airships.

The design and manufacture of aircraft radio is a distinct problem of its own, apart from other types of radio equipment. Obviously, the stringent limitations of weight and space must enter into the calculations, while care must be taken to insure simplicity of operation together with maximum efficiency.

Engineering staffs have applied themselves to the task of developing suitable aircraft radio equipment that could be standardized for meeting the requirements of a wide variety of airplanes.

As a result, transmitting and receiving equipment for installation on practically any type of airplane has been produced, rated at 100 watts, with a radio telephone transmitting range of about 150 to 200 miles, and a radio telegraph (CW) transmitting range of from 500 to 800 in daylight. The total weight, including wind-driven generator, is 86 pounds. This equipment may be had with a dynamotor energized from the same 12-volt storage battery which controls the starter and the lights of the plane.

The receiving set, which, of course, requires careful adjustment in tuning in a wide range of signals, is mounted conveniently near the operator. The aircraft transmitters have been designed to operate on any fixed frequency in the wave band set aside for aircraft communication. This band is between 2250 and 2750 kilocycles, which is the approximate equivalent of 133 to 109 meters. It is interesting to note that the wave length may be adjusted while the plane is on the ground, preferably, by means of the test box, so as to have the greatest efficiency of adjustments.

In both transmitting and receiving units, the utmost care has been exercised to protect the vacuum tubes from the shocks incidental to rough and stormy flights and forced landings.

As a valuable aid to air navigation a special beacon receiver has just been brought out to operate in the wave-length range of from 580 to 1100 meters. With this receiver, which may also be used for other radio communication purposes, the pilot can determine the course he is flying by means of the characteristic signals sent out by beacon beam transmitter stations. The Department of Commerce is rapidly installing these beacon beam radio stations at the principal airports for the particular use of the airmail planes. The beacon receiver may be conveniently placed anywhere in the plane within thirty feet of the operator. A single dial on the dashboard is all that is necessary for remote control operation.

The aircraft radio antenna is simply a trailing wire provided with a stream-lined weight. This wire, which may be anywhere from 80 to 130 feet in length, is controlled by an antenna reel that feeds it through an insulated bushing or fairlead in the floor of the cockpit or cabin.

Needless to say, the power source presents a delicate problem in the aircraft radio installation. In the new aircraft radio equipment, however, all the necessary power may be had from either a wind-driven generator, or a dynamotor installed in the cockpit. The generator is provided with an air propeller which automatically maintains the correct normal speed just so long as the plane stays in the air. If, however, maximum speed is desired from the airplane, the generator may be arranged with a retractible mount, so that it may be drawn into the cabin when not in use. The dynamotor operates from a 12-volt storage battery which may be the same one that furnishes the power for starting and for the lights.

The usual radio installation serves the purpose of an inter-communicating system between pilot and radio operator or passenger, in addition to radio communication. In fact, by means of a switch on the control panel, the pilot and the radio operator or passenger can speak back and forth, since both may be provided with helmets containing headphones, as well as microphones carried by chest straps. If the pilot or radio operator wishes to telephone to ground or to another plane, the control switch is flipped to the radio telephone position. It is also a simple matter to arrange for radio telegraph communication with other planes or the ground.

The Military Significance of the Recoil Principle. The Rocket Problem

By Robert W. E. Lademan

Extract from the *Militär-Wochenblatt*, translated by Colonel George Ruhlen, U. S. A., Ret.

The rocket automobile trials of Opel and others of the past year resulted only in confirming the views of the American university professor Robert H. Goddard, but they have directed the attention of larger circles to the application of the recoil principle and have, it is hoped, brought that subject into the foreground in our country also. There were employed with the Opel vehicles rocket explosive material that, it is to be regretted, manifested, aside from other defects, unsuitable nozzles. The loose arrangement of these five-kilogram gunpowder rockets contributed much to the catastrophe predicted by me.

[The author here enters upon a history of the powder-propelled rocket from its earliest discovery and use in war and for other purposes to about 1866 and 1870 when its use as a fighting war weapon was practically discontinued and its retention for military purposes restricted to signalling and illumination. He then proceeds with that which follows.]

The proposition to propel the rocket with higher and more rapidly acting explosives than the ordinary gun powder has been confronted with many and almost insuperable difficulties on account of the short explosive action and the immense pressure exerted on the container and its destructive effect on the material used in its manufacture.

This brings us to the consideration of the use of fluid explosives, petroleum, gasoline, etc., as the driving forcc of the rocket as of far greater advantage than solid substances like gunpowder; aside from their ten times greater heating property and rapidity of exhaust action they permit refilling without any material difficulty; the fluid propelled recoil action (or, in short—recoiler) is, together with a greater development of power, lighter, safer, and more long lived than the high-explosive rocket.

The recoiler is, in fact, one of the most fundamental and most simple of non-elementary machines. Its most important part is the burning chamber or "oven" which, by intervention of a gradually diverging tube terminates in a nozzle. Burning and propelling materials are fed with pumps as is done with a gas-burning motor or they are pushed into the oven by appropriate utilization of chemical action over the dispersing nozzles where ignition takes place. The gas-forming results of the ignition acts with great rapidity through the door of the oven into the neck of the nozzle and further on with an exhaust velocity of from 3 to 5 kilometers per second according to the material selected for ignition. It is worthy of remark that aside from the action of the pumps there is no other rotary or vibratory action movement of any solid mass.

The development of these recoilers has proceeded almost without any connection with powder rockets or rockets generally. Aside from a number of well known applications of direct recoil of emerging water columns the history of fluid or gas-driven recoilers is wholly unknown. Recoil action was known to the ancients as the Aeropyle of Hero of Alexandria; today we see the same apparatus as a device for sprinkling lawns with the principle of the Segner water wheel. Newton developed a small wagon propelled by recoil action of emerging water vapor.

Recoil promoters were silent for nearly 200 years after Newton. About 30 years ago the Peruvian engineer Paulet tried a small fluid recoiler; he used gasoline and nitro-dioxide. The recently invented vanadium steel served as the material for the container.

But the Russian scientist Ziolkowisky made a nearer approach to application of the direct recoil in his attempts to reach heavenly bodies. It is due to his extraordinary efforts and studies that measures are being inaugurated by the Central Institute of Aerodynamics at Moscow to build registering rockets to reach a summit elevation of 200 kilometers or more.

A second prominent advance worker in this field is professor Goddard, a resident of the United States. He has devised a highly valuable recoiler for registering rockets for meterological purposes by his theoretical and practical studies. According to the annual report for 1927 of the National Advisory Committee for Aeronautics systematic plans for further experiments are being carried on at Langley Field.

The recoilers permit for their use as motive power gas and explosive torpedoes—which later failed to work in experiments made by the Krupps in 1901-07 with the powder aerial rockets invented by Unge. Steering and safe laying is done automatically by means of short wave direction which we have learned by ample experience. The tip of the drop form aerial torpedo is provided with a contact fuze which does not however preclude the application of a time fuze also. Thanks to the great height of the trajectory—from 40 to 100 kilometers or more—these torpedoes, charged with explosive chambers or poison gas containers, are inaudible; in consequence of their restricted size and the absence of any appearance of flash at the carefully adjusted nozzles they are also invisible. Their velocity is, at less than 30 kilometers elevation, 2 kilometers per second and greater at the vertex of their trajectory and for that reason they are practically immune from being hit by antiaircraft fire. The flying torpedo is *invisible, invulnerable, and inaudible.* Its range is, as has been shown by my computations, beyond any ordinary calculated land distance. The penetrating power is an elementary force; even though the descent of the winged air torpedo is, to a certain extent, retarded or braked by the increasing density of the atmos-

phere and other artificial expedients; the destructive heating of the exterior surface like that to which meteors are subjected is absent.

The recoil-driven flying torpedo can be worked out and developed as a flying bomber and further as an artillery projectile. A bombing flying craft can cover a comparatively small area only with expenditure of expensive material and a large service personnel and many hours are required for preparation and its approach during all of which it is subjected to enemy attack and pursuit. And finally, assurance of hitting a definite target from a height of from four to five kilometers is questionable. The principle advantage of the artillery weapon lies in the practicability of enclosing the enemy in a definite zone cover and concentrating a destructive fire on him at any point at the same time.

The aerial torpedo has many advantages in comparison. It cannot be deemed that a runway 50 meters in length could not be arranged at any place in the rearward areas more cheaply, more securely than is required for a large airplane airport. No valuable human lives are exposed in the unmanned flying torpedo and there need be but little solicitude about systematic observation of meteorological weather conditions on the field of operations and the surrounding territory. I see the principal value of the aerial torpedo in the actual shortening of the fighting action, not only from material but also from moral grounds. The mental impression of feasible long-distance fighting action upon troops and population beyond one's own front will far exceed that of former years. Distance no longer plays a role and electric waves can reach anywhere. The recoiler can be used equally in the defensive. The flying torpedo is in fact only an arbitrarily selected example of the military utilization of recoil action; one can of course use it against all kinds of targets with promise of a fair degree of accuracy: not only against fortifications, troop assembly places, industrial centers, ports, and larger battle ships but as minor torpedoes against slow-flying all-metal airships. It will be an excellent carrier of large quantities of poison gas and poison screening vapor in naval warfare.

A further use of the flying torpedo not heretofore mentioned is replacement or substitution by torpedoes of the heavy armored fighting artillery. The aerial torpedoes far exceed ballistic projectiles in range and power of penetration and there is only a question whether or not the dispersion is greater than that of the artillery projectile. Experience heretofore acquired with projectiles with rocket propulsion have disclosed great dispersion. The super-artillery of tomorrow provided with technical impact adjustments, the surface wing plane for example, whose form is dependent upon conditions of velocity of sound, will call for larger mass for the purpose of acquiring greater living force; for that reason there will be available place and weight-carrying capacity for the 10 to 15-kilogram weight of self steering appliance. The torpedoes will become lighter for use on the water and will have to rise only a few meters over the water surface; the heavy armored containers will disappear. Their place will be taken by not more than 2 or 4 moveable starters like those of a catapult or minenwerfer. The total weight of an equipment, even with an equal number of aerial torpedoes will be less than that of the armament of major fighting units. The endurance of the runway appliances is incomparably greater than that of the barrels of high-caliber guns. The expenses are less. Finally, the principal value of the recoil-driven aerial torpedo is not that it will displace heavy artillery but rather in its greater possibility of achievement in that field. It is materially and morally more effective and above all less expensive to send a number of dozens of aerial torpedoes against the enemy than an entire bombing or pursuit squadron or to develop a valuable war navy and short-lived long-range guns; and to subject all that fighting material together with its irreplaceable service personnel to enemy fight action. The deciding battle of the future will be carried on not only from vessel to vessel, from trench to trench but from port to port and still further land to land.

Chinese Moon-Feast and Mid Autumn Festival

By H. G. O. Hallock

The Chinese 15th of the 8th month is called "Tsoong Tsiu"—Middle Autmn. On that day they have theatricals before all the gods in the temple and burn the "Shaung-teo"—incense bushel. This bushel-like measure is made of incense sticks. The largest "bushels" sometimes measure as much as 20 feet in diameter. In the middle of the "bushel" is a long, large stick of incense made up of thousands of thin incense sticks the size of vermicelli. On the afternoon and night of this day each family also burns an incense bushel at home. These are smaller than the ones burned in the temple. On this day they who can so afford eat moon-cakes and all kinds of nice things. The incense bushel is decorated with flags and many-colored dragon-gates something as children at home put candles on their birthday cakes; but the children in China take the flags and dragon-gate decorations from the bushel before it is burnt, and have great delight in playing with these, marching up and down the streets.

I asked the Chinese why they burn the incense bushel and eat the moon-cake, and worship the moon with candles, incense and food on this day. They answered that there are many reasons for it and many stories are told about it. One of the reasons is because there is a lady-god in the moon. Her name is Zaung-noo. She is said to be exceedingly beautiful. From the beginning of time to the end there never was nor will be one as beautiful as she. She was once upon a time a woman of this world but became displeased with her husband and all the world and fled to the moon. On this 15th the real story of why she fled is acted out in the long theatrical plays attended by throngs of people. In ancient times on the 15th of the 8th month when they burned the incense bushel the sweet fragrance would go high up to the moon goddess. She took pleasure in it and manifested her approval by coming near earth riding on a cloud and people could see her beautiful face. But now men's hearts have become wicked, and the world is full of sin, so the incense is not so pure as formerly and it does not rise so high as to reach the goddess in her palace and so, not enjoying its fragrance, she comes no more on the clouds; but people still offer incense and hope she will appear sometime.

They say that in the moon this goddess has a most beautiful castle. It is called the "Yuih-Koong"—Moon Palace. Only one human has ever seen its glories. Once, during the Dong Dynasty, a Chinese king, called Ming Wong, by the Magic of a holy monk, was enabled to mount up from the earth to the Moon Castle to hear the music and see its beauty. He was allowed to stand outside for only a very few minutes. By that time the goddess knew that the king of man was there. She was very angry at the monk for leading the king to her holy land. Soon from the Castle came most unpleasant sounds. The monk understood that it was the queen's giving vent to her wrath and he quickly led the king back to earth.

Echo Sounding Gear

Since its inception just over two years ago, the new method of echo sounding at sea to replace the lead and wire has made rapid and remarkable progress. The lecture on the subject given at the Royal Geographical Society by the Hydrographer of the Navy shows that once again the fighting sailor has made a step forward in scientific progress, of which not only himself but sea-farers generally get the benefit. Echo sounding was mentioned at the International Conference of Hydrographers in 1919, but was then not far enough advanced. It was known that foreign countries, especially the United States and France, were at work upon it, and, as nothing was published in this country, the impression got abroad that we were behindhand. The reverse is the case. The first practical application was made by the British Admiralty. All our surveying ships were fitted, and the experience gained in them is being utilized in extending the invention to fighting and merchant vessels.

A report from the navigating officer of the *Australia* after he had come safely through 12-hour and 25-hour fogs in the St. Lawrence and off Nova Scotia spoke with enthusiasm of the apparatus, and of a feeling of confidence which he had never known before. In his run from Halifax he "got an unexpected set of seven miles and bowled it out entirely by soundings." In time every well-found ship will be fitted for the new method, and with it, and directional wireless, the lot of the captain and navigator in thick weather and when approaching land will be a far happier one.—*The Army, Navy and Air Force Gazette*, Mar. 14, 1929.

New Submarines

After a delay of nearly twelve months, due to the withholding of credits for them, orders have at last been given for the five contract-built submarines in the 1928 programme. The three firms which have taken up this work under the post-war *regime*, Vickers-Armstrongs, Cammell Laird, and Beardmore, share the contracts between them. It will not be until 1931 that these vessels will come into service, and the delay in proceeding with the submarine replacement programme is likely to produce an unfortunate situation in the meantime. The official life of a submarine is reckoned at twelve years. Orders have already been given for the scrapping of the last of the vessels completed in 1917 ("L" 1, "L" 2 and "L" 7), and even for the first of those completed during 1918 ("L" 8). There were 16 other submarines completed during 1918, and if these pass off the list at their appointed time, followed by the 15 completed during 1919, the total of submarines will have been reduced by the end of 1931 from the 52 at which it now stands to 20. Towards making up this wastage, 18 new vessels, in three groups of six each, will have been completed, so that the actual total will be only 38 vessels. For an establishment of 60 submarines, new construction ought to proceed at an average rate of five a year, but it must be remembered that only four were laid down in the nine years between 1918 and 1927.—*The Army, Navy and Air Force Gazette*, Mar. 14, 1929.

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> *By throwing down our arms and practically disbanding our Army and Navy, we at the same time are rendering ourselves defenseless, not only against aggression from other less idealistic nations, but also against revolution from within.*—Assistant Secretary of War, Dwight F. Davis.

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. W. E. COLE, *Colonel, Coast Artillery Corps, President, Coast Artillery Board.*

Project No. 694, Test of Erosion Charts.—The Coast Artillery Board is in receipt of charts showing loss in velocity due to erosion. The following test on the erosion curve for the 10-inch gun is proposed:

a. Star gauge the 10-inch guns of *Battery Church* or *Eustis.*

b. Obtain the muzzle velocity of these guns with a Jekaduma chronograph. This will require not less than five velocity rounds with each gun.

c. The above will be done after the Jekaduma chronograph is received at Fort Monroe, and prior to the commencement of the season's firings.

d. Insofar as practicable, all 10-inch firings at this fort during the coming spring and summer should be fired from either *Battery Church* or *Battery Eustis.*

e. At the end of the last target practice this summer, star gauge the guns and take muzzle velocities as before, all velocity rounds being fired with the same lot of powder.

f. The change in measured muzzle velocity corresponding to the erosion as determined by the star gauging can then be compared with change in muzzle velocity as determined by the erosion curve.

Project No. 695, Confidential.

Project No. 696, Antiaircraft Trial-Shot Problem (Aberdeen, 1928).—The Coast Artillery Board is preparing a Bulletin for publication covering the methods developed at Aberdeen Proving Ground in 1928, with a view to standardization of the trial-shot problem for antiaircraft artillery.

Project No. 697, Service Test of Jekaduma Chronograph.—The Jekaduma Chronograph, tested at Aberdeen Proving Ground in 1928, has been issued to the Coast Artillery Board for service test at Fort Story and at Fort Monroe during the Spring and Summer. It will be tested in firings with all types of Coast Artillery materiel, *i. e.*, antiaircraft, tractor drawn, railway, and seacoast. The Jekaduma will also be tested in connection with the test of Erosion Charts to be conducted under Project No. 694.

Project No. 698, Test of 155-mm. Sight Mount T-5.—A new 155-mm. Sight Mount T-5, with a panoramic sight and a 2-inch telescopic sight, has been issued to the 51st Coast Artillery (TD) for service test under the supervision of the Coast Artillery Board. This sight mount has been designed to replace the unsuitable panoramic sight for Case II fire. This sight mount will also be tested in Case II firing by the Department of Artillery, Coast Artillery School, in connection with instruction of the Battery Officers' Class.

Project No. 699, Graduation of Drum of M-1 (Vickers) Corrector to Take Account of Muzzle Velocity and Density.—This subject is under study. Its solution will permit the Vickers Corrector to be used as a ballistic computer.

BOOK REVIEWS

Napoleon and His Family: The Story of a Corsican Clan, Madrid-Moscow (1809-1813). By Walter Geer. New York: Brentano's. 1928. 6¼"x 9¼". 384 p. Il. $5.00.

In his writings to date, Mr. Geer has specialized in France of the Revolutionary and post-Revolutionary periods. His published works include a study of Napoleon III and a happy excursion into the American Civil War, but otherwise he has restricted himself to the French Revolution and the Bonaparte era. He has already written particularly of Napoleon himself, of Josephine, and of Marie-Louise. Now he takes up the other members of the family.

The current volume is the second of a set of three, which are no more than necessary to sketch the careers of the numerous relatives and in-laws to whom Napoleon devoted much time and thought. The set is based upon periods of Napoleon's own history, and the first volume carried the clan through the tribulations of the Spanish episodes of 1808. The present book begins with the Austrian crisis of 1809 and continues the story of the Bonaparte family to include the close of the disastrous Russian campaign which brought to an end another period in the career of Napoleon.

One of the greatest handicaps under which Napoleon suffered was the fact that he was not born the eldest in his family. The Corsican tradition of deference to the oldest son, combined with Napoleon's own strong clan spirit, frequently created situations which reacted disadvantageously. Without the clan spirit he could have cut himself loose from his family and could probably have found for the kingdoms he set up rulers who would have been more loyal to him. His brothers, made kings by Napoleon, came to believe in the Divine Right of kings, ceased to be Frenchmen, and greatly embarrassed the Emporer in many ways. His sisters, too, made it necessary for Napoleon to make a deliberate effort not to know too much of what they were doing, for their histories, written in full detail would not make nice reading.

Joseph, in the four years from 1809 to 1813, shows no great capacity in Spain but manages to hold to his tottering throne through his advantage in being older than Napoleon. Louis, as king of Holland, becomes more Dutch than the Hollanders themselves, separates from Hortense, breaks with Napoleon, and is retired. Jerome continues to show a lack of capacity, is given a kingdom, and wrecks Napoleon's plans in the early phases of the Russian campaign. Lucien, probably the most capable of the Bonaparte brothers after Napoleon, continues to reject the Emperor's terms for reconciliations and leaves Italy, whence he is taken to England. Murat, married to Caroline, retains his throne at Naples, although he cannot be considered entirely loyal. The most faithful of the family was Eugene, Napoleon's stepson, who served as loyally after Josephine was divorced as before. This divorce was one of the two outstanding events in Napoleon's domestic circle of the time, the other being the birth of the king of Rome.

The whole period was one of suspicion, jealousy, and intrigue within the family, providing a tangled skein which the genius of Napoleon was unable to unravel. Mr. Geer, in his inimitable way, cleverly follows all the closely interwoven threads and shows how impossible it became for Napoleon to cut his way clear. He made mistakes and became only more deeply enmeshed. In the end, as the author will undoubtedly show us in his next book, the Emperor is carried to his downfall, principally because of his family.

How much different history might have been had Napoleon been an only son!

Gentleman Johnny Burgoyne. By F. J. Hudleston. Garden City: Garden City Publishing Co., Inc. 1927. 5½"x 8". 351 p. $1.00.

This is another of the books that have proved their worth and have been chosen for publication in the Star Series at a popular price. In this series it appears in a class with *Trader Horn, Revolt in the Desert, Recollections and Letters of Robert E. Lee,* etc.

General Burgoyne was a happy-go-lucky soldier with some ability and more self-esteem, who was known, in his day, as "Handsome Jack" and who came to grief at Saratoga. Mr. Hudleston, with all the records of the British War Office at his disposal, finds "Gentleman Johnny" interesting and makes him so to us, although that would not require great effort, but even the author, unlike most biographers, does not attempt to make him appear great. He calls Sir Guy Carleton "by far the ablest British General in North America," although Dr. Randolph G. Adams and Hoffman Nickerson disagree with him, and all three of them overlook the claims of Cornwallis.

The book is interesting—exceedingly so, despite the author's determined effort to be funny, an effort that is sometimes labored and permits him to stray from his story. The study of the Saratoga campaign, marking as it does, the turning point of the Revolution, is important and General Burgoyne himself played a sufficiently prominent part in the war to be worth knowing. He was a gallant gentleman and followed gallantly that "profession which *may* be useful, but is *often* dangerous."

The Flight of the Southern Cross. By C. E. Kingsford-Smith and C. T. P. Ulm. New York: Robert M. McBride & Co. 1929. 295 p. Il. $2.50.

There are four books that should rest side by side on the library shelves of those who pretend to keep abreast of the wonderful age in which we are living: *We,* which takes us to Paris with Lindbergh; *Record Flights,* in which we are carried to Germany with Chamberlain; *Skyward,* wherein we accompany Byrd; and now *The Flight of the Southern Cross,* which transports us across the Pacific to Australia. To each one of these narratives there is a similar objection. Being written by one of the principals of the voyage in each case, we suffer a loss in reading from the modesty which each one displays in writing. There is a certain indescribable something missing in the pages—which well becomes the writers to have omitted.

The authors of *The Flight of the Southern Cross,* possibly, give us more technical details of their preparations than is true in companion books. We learn of wing loading, power loading, and composite loading. We read in detail of the technique of blind flying and of the various instruments to assist therein. Problems of navigation and navigation instruments are covered. The personal training and preparation of the crew—in short, the account is complete from the end of the World War, when Kingsford-Smith first began to project his flight, until the Southern Cross landed at Sydney.

Certain features stand out preeminently:

(1) The length of time spent in working up the flight.

(2) The personal and mechanical preparation.

(3) The financial difficulties encountered.

(4) The deadly monotony of the night hours.

(5) The terrific experience of riding the storm between Suva and Brisbane.

(6) The continual worry about gasoline consumption.

We read every word in the newspapers, avidly, of this great flight. Now it is really worth while to study over the actual details of the flight and see how it was accomplished. *The Flight of the Southern Cross* is the very readable account of a great achievement, well prepared and ably carried out.—B. F. H.

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A Mess Room in Hawaii
Battery C, 16th C. A.

With the exception of the bananas, flags, and buntings, the decorations—hanging baskets, varied colored croten plants, etc., are normal. The tables are lacquered white and the stools green. The white and green color scheme is carried out and the result is a transformation of a mess hall into a dining room.

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Antiaircraft Defense Tactics With a Mechanized Force

By Captain Lucas E. Schoonmaker, C. A. C.

Purpose of the Article

THE purpose of this article is to discuss the employment of antiaircraft artillery with a mechanized force. In order to visualize the problems which confront the antiaircraft artillery when operating with such a force, a brief description of the composition of the force will be given, together with a general outline of the tactical employment of the force itself. By examining a few of the dispositions of the force, its vulnerability to air attack will be disclosed. Then by a study of the principles of gun and machine-gun defense and the characteristics of the new types of antiaircraft weapons, an endeavor will be made to show the type of antiaircraft defense which is best suited for the protection of a mechanized force.

Description of a Mechanized Force

A mechanized force is a unit equipped with the latest mechanical developments in weapons, armor protection, and self-propelled fighting vehicles, suitable for rapid movement across country and on the battlefield. Its development was due to a desire to restore to modern warfare something which had been lost in the last war—mobility.

As now constituted, tanks are considered the principal attack elements of the force. Other arms are included as auxiliaries to furnish the elements of holding power, security, fire support, and facility of movement and supply. As the force is still in its experimental stage, its most economical size and the exact proportion of the various arms which constitute it, as well as their equipment, are still matters of speculation and are beyond the scope of this article. It is sufficient to state that a mechanized force of the future will probably be made up of the following units:

a. Light tanks, and probably medium tanks. The former may be carried on large trucks on the road, or they may run under their own power at all times.

b. Armored cars, mounting machine guns and one pounders, for security and reconnaissance. These are at present operated by the Cavalry.

c. Infantry, mounted in trucks or, possibly, in cargo carriers with track laying elements, to furnish the holding power which tanks lack.

d. Machine guns carried on light, cross-country trucks, such as the six-wheeled Chevrolet ¾-ton truck developed by the Ordnance Department.

e. Artillery to furnish fire support. At present the 75-mm. tractor-drawn guns are used. These are portéed on trucks on the road. Possibly a larger gun with greater range may be included.

f. Chemical Warfare troops, to furnish gas and smoke clouds, as well as gas protective apparatus.

g. Engineer troops, to facilitate movement by strengthening and repairing bridges, repairing roads, etc.

h. Signal troops, for communications.

i. An antiaircraft unit, the composition of which will be discussed in this article.

j. Supply elements for ammunition, rations, and gasoline.

k. Repair units, ordnance and quartermaster.

l. Medical unit.

m. Possibly an *Air Corps* unit.

The bulk of the troops composing the force will be tanks, infantry, and artillery; the other units will only be present as small bodies of specialized troops. Some idea of the size of the force can be gathered from the fact that in 1928 the force comprised about 250 motor vehicles and occupied a road space of 8 miles. It is expected that in future the force will consist of about 500 motor vehicles.

General Employment of the Force

The role of the mechanized force is essentially offensive. Surprise, speed, and depth of penetration in the attack characterize its operations. The tactics of the force as a whole are based upon supporting and assisting the attack of the tank elements and upon exploiting the successes gained in the tank attack.

As constituted at present, the mechanized force can travel 100 miles a day without difficulty. Road speeds of 10 miles an hour have been made with heavy trucks, and speeds as high as 25 miles an hour with light trucks. It is expected, when new equipment becomes available, that the force will be able to travel across country with as much ease as it now travels upon roads. The first problem which confronts the antiaircraft artillery is then one of mobility; the antiaircraft guns must be able to move with the force wherever it goes. This, as will be pointed out later, has been successfully solved with the latest types of equipment.

By reason of the great force and striking power of a mechanized force, it is certain to be a tempting target for a hostile aerial activity, and its destruction or what is also of great importance, its temporary immobilization, will be attempted without delay.

For the purpose of discussing antiaircraft defense tactics, the operations of the force may be roughtly classified under three heads:

a. Marches on the road or across country in the presence of the enemy.

b. Halts in bivouac, either by day or by night.

c. Attack formations, including approach formations to the attack.

This classification is made because under different formations the force presents a different type of target and exhibits a varying degree of vulnerability to air attack.

a. Marches on the road.

In this formation the force may travel in a long column or in several columns on parallel roads, or it may move in detachments using the same road at different times. At any rate, the target presented is a long, rapidly moving narrow one. This is not a very favorable bombing target from high altitudes; hence we can conclude that the most likely form of air attack to be expected will be made by planes swooping down at low altitude over the column and either attacking it with machine guns or dropping gas and smoke on it. Such an attack could be executed with great rapidity and would materially retard the progress of the column, due to the confusion which would inevitably result on account of casualities among the drivers and damage to the trucks from punctured tires and radiator leaks.

b. Halts in bivouac.

There are bound to be times when the force will be halted in bivouac. The force may march by night and remain concealed by day, or it may be necessary to remain several days and nights concealed in one locality for tactical reasons. At this time, the force is spread out over an area and offers a tempting bombing target. Its protection in this situation is of paramount importance, as a few well-placed bombs might rob it of a great part of its strength.

c. During the attack.

The formation which the force adopts during the attack depends on various conditions such as the nature of the terrain, the amount of frontage covered, the position occupied by the enemy, whether it is to be a flank attack, whether the enemy is strongly entrenched or not, and so forth. In general, however, the following may be considered as the various phases which are successively passed through by the force when making an attack.

The force is approaching from a distance in column formation. When nearing the battlefield, it begins to deploy for its approach march. Various units may use different routes to get to the positions assigned. The light tanks, if carried on trucks, are detrucked. The 75-mm. guns are taken off their trucks and are dragged forward behind their tractors. The infantry detruck. Although these operations are completed very swiftly, and may in fact be finished within an hour, during this preparatory stage the units, being spread out, are liable to bombing attack.

When the attack actually begins, the tanks advance in waves, supported by artillery fire on the hostile position and smoke clouds to blind the enemy,

followed by the infantry for mopping up and holding the ground gained. During this period the enemy planes will attack both by bombing and by swooping over the troops. This low-swooping attack over the advancing waves of tanks and infantrymen is believed to be the one which will be the most necessary to combat.

At the conclusion of the attack, while the ground gained is being consolidated and the force, which necessarily has become scattered, is being assembled, it is again a target for bombing attack.

Antiaircraft Defense Tactics

Having shown the vulnerability of the mechanized force to air attack, let us examine the principles of antiaircraft defense and the characteristics of the latest antiaircraft weapons to see just what protection can be given to the force by each weapon.

The primary mission of antiaircraft artillery is to furnish an adequate local defense of our ground forces and establishments against hostile aerial activity. In the case of the mechanized force, we are faced with the problem of a large ground force which shifts rapidly from place to place, at times across country, at a considerable rate of speed. This force must have protection both when stationary and when moving. It is obvious that antiaircraft units to be of any value in such a force must possess the following characteristics:

a. Cross-country ability.

b. Speed.

c. Ease of changing from travelling position to firing position and vice versa.

d. Rapidity of engaging targets.

e. Fire power.

Let us examine the following weapons and see if they possess the above characteristics:

a. The 3-inch A. A. mobile gun M-1.

b. The 37-mm. mobile gun.

c. The .50-caliber machine gun.

a. The 3-inch M-1 Mobile Gun.

The 3-inch M-1 mobile gun is a trailer mount weighing about 8½ tons. It is equipped with pneumatic balloon tires of large size (40″x 9″) which, on account of the low ground pressure per square inch, enable it to be moved across country with considerable ease. For a prime mover the 5-ton 4-wheel-drive Coleman truck or, as it is also called, 4-wheeled tractor is used. This vehicle is also equipped with large pneumatic tires (42″x 9″) which enable it to negotiate rough and soft terrain. An interesting feature of the truck is an auxiliary transmission which, when engaged, multiplies all gear ratios by 3.3, thereby giving a very high reduction in low gear (139 to 1).

Field tests of the M-1 gun towed by the Coleman truck have shown that a

speed of 25 miles an hour can be maintained on level roads, that the truck will pull the gun up any hill which the force as a whole can negotiate, and that the gun can be pulled across country through sand, mud, and ditches far from roads. This unit, therefore, fulfills the first two requirements, cross-country ability and speed. If it were desired to increase the speed of the mechanized force, the speed of the gun could be increased by using as a prime mover the Coleman 7½-ton truck, a model with a larger motor, which has appeared during the past summer. The only minor objection which can be raised against the mobility of the gun is that its weight may necessitate strengthening bridges on unimproved roads.

The M-1 gun can easily be changed from travelling position to firing position; a trained crew can complete the operation in 13 to 20 minutes. At first sight, this appears a longer time than was taken by the old M-1918 trailer gun, which could be placed in firing position in 4 to 6 minutes. However, it must be remembered that the M-1 gun can be emplaced in positions where the 1918 gun cannot go and that much time was wasted uncoupling the old gun on the road, unloading the tractor, and pulling the gun into the position desired, before it was changed from traveling to firing position.

The M-1 gun has a muzzle velocity of 2600 f. s., a maximum vertical range of 10,000 yards, and a horizontal range of 15,000 yards. Its primary objective is bombardment aviation, its purpose being to break up or destroy bombing formations before they come within effective striking distance of their objective. The ceiling of loaded bombing planes, equipped with superchargers, is at present below the effective fire of 3-inch antiaircraft guns (Martin bomber, 8000 feet; Curtis N. B. S. 4, 10,000 feet—Monteith Aero-dynamics). With modern fire-control instruments, stereoscopic height finders, and Vickers or similar data computers, the data can be computed as soon as the plane is spotted. Fire with four guns can be opened as soon as the target comes within range. With a rate of fire of 88 rounds per battery per minute and with a time of flight of 10 seconds, there would be 14 shots in the air before the first one burst or, in other words, before the pilot was aware that he was under fire. The average accuracy of the 3-inch antiaircraft gun is about 9 per cent, or, roughly, one hit in 11 shots, so that the chances of securing a hit in the first few seconds of fire are favorable.

It is believed that the gun possesses the necessary fire power for use with the mechanized force and that targets can be rapidly engaged, provided the gun is already in firing position at the time the target appears.

The gun is also employed to attack observation planes with the object of making their mission as difficult as possible by driving them off, by forcing them to fly at high altitudes, or by forcing them to maneuver to avoid being hit.

b. The 37-mm. Automatic Gun.

The 37-mm. gun on mobile mount is fully as mobile as the 3-inch gun and, on account of being lighter, will probably travel faster on the road. It can be

easily placed in firing position, the operation taking less time than that for the 3-inch gun.

The gun has a maximum vertical range of about 4000 yards and a maximum horizontal range of 7000 yards. Its rate of fire is between 80 and 90 shots a minute. It fires a shell provided with a percussion fuze, sufficiently sensitive to produce detonation on contact with airplane fabric. A hit on any part of the plane will cause material damage. The fuze is provided with a fixed time element, which detonates the shell in the air, thus making the weapon safe for use over friendly territory.

The 37-mm. gun possesses one advantage over the 3-inch gun. Due to the rapdity with which it can be shifted from one target to another, within its effective range, it is capable of firing on entire formations in a brief interval of time. It is therefore a most efficient weapon for employment against attack aviation at lower altitudes. Due to its shorter range, it cannot replace the 3-inch gun but supplements it by furnishing effective defense against aerial attacks which the heavier caliber has been unable to break up.

c. The .50-Caliber Machine Gun.

The .50-caliber machine gun, with its present ammunition, has an effective range of about 2000 yards. It fires about 450 shots a minute. In order to be effective the bullet must hit a vital spot in the target. The platoon of four guns is the normal fire unit, but it is possible that the four-gun multiple mount may be used instead, as there is less dispersion when firing from this mount than from the tripod. The present average accuracy throughout the field of fire is approximately one per cent. With a rate of fire of 1600 shots per platoon per minute, this gives an expectancy of 16 hits per platoon per minute, or one hit each 3.75 seconds.

The four-gun multiple mount can be made mobile by mounting it on a light trailer, which would make it suitable for use with the mechanized force. The entire mount might also be placed in the body of a truck. The quadruple mount can be fired from the trailer or from a truck body and is therefore ready to engage targets the moment they appear over the column. For short ranges the fire is guided by tracer but for the longer ranges data computers are being developed.

Protection of the Mechanized Force

a. The Moving Column.

The normal method of covering moving forces by antiaircraft gun fire is by the occupation of successive positions along the line of march. This requires more than one battery and also pre-supposes that the antiaircraft battery can travel faster than the column. With a rapidly moving column, such as the mechanized force, this is out of the question, and the only gun defense which could be provided would consist of defense of the starting point or the point of

arrival or possibly the defense of some particular sensitive point along the line of march, such as a bridge.

It has been stated that the aerial attack to which the moving column is most likely to be subjected is that made by planes which suddenly appear, swoop down at low altitude over the column, and disappear again. Such fleeting targets cannot be engaged by 3-inch guns nor at such close range by 37-mm. guns. The .50-caliber machine gun, due to the speed with which it can be brought to bear on rapidly moving, short-range targets, is the ideal weapon for work of this sort. Quadruple mounts on a light trailer, placed at least one per mile of column, would provide a reasonable defense. Special circumstances might make it advisable to place machine gun units at or near the head of the column, with the mission of covering defiles until the column has cleared them.

We then conclude that the principal weapon for the defense of the moving column is the .50-caliber machine gun.

b. Defense of the Bivouac Area.

As has been pointed out, the force in bivouac presents a bombing target, since it is scattered over an area. In the defense of such a position, the 3-inch antiaircraft gun battery is supreme. The 37-mm. gun can be used as well, but it is not as effective, since the bombing planes can fly near the limit of its maximum vertical range, which is beyond its effective range. The 37-mm. gun can be used, however, as a supplementary defense.

The protection of the mechanized force from bombing attack when in bivouac is of such importance that it is believed that this one fact warrants the inclusion of a gun battery in the force. Of course, a platoon of searchlights with two sound locators would have to be included for night operations.

c. During the Attack.

During the attack, the force is subject to all forms of hostile aerial activity. It is believed that the gun batteries 3-inch and 37-mm. should precede the force and go into position first to cover the deployment of the force and to drive off any enemy reconnaissance planes. The machine guns, which would arrive scattered through the main column, could either be left for the protection of various units or could be placed in position near the line of departure to open fire on the planes which will swoop down over the advancing waves of tanks and infantrymen. These guns, being mobile, could be moved forward as the attack progressed.

d. Emergency Use of Antiaircraft Weapons.

While the destruction of hostile aircraft is the primary mission of antiaircraft artillery, if opportune terrestrial targets are present, all classes of antiaircraft weapons can be used with effect against ground targets. It is not the

purpose of this article to advocate a hybrid gun, used equally against ground and air targets, but it must be remembered that the mechanized force is an unit acting alone and in emergencies must use the resources which are immediately at hand. Having the 3-inch gun, the 37-mm. gun, and the .50-caliber machine gun, there is no reason why, in special cases, full advantage should not be taken of their capabilities.

The most conspicuous example of such a case is the use of the 37-mm. automatic gun against tanks. The ordinary battery of field guns is helpless against a tank attack on the flank of the battery line. An effective antitank gun must have all-around fire and rapid traverse and elevation. Antiaircraft guns possess these qualities. It would be foolish not to make use of them should occasion arise.

Another case, which is probably extreme but which might arise, is the desirability of bringing the enemy under fire while still out of range of the ordinary 75-mm. field piece. Unless a piece of artillery heavier than the 75-mm. field gun is included for this purpose, the 3-inch antiaircraft gun, the horizontal range of which far exceeds the 75-mm. gun, could be used if equipped with proper range scales and special ammunition.

Composition of Antiaircraft Unit in Mechanized Force

When the mechanized force is on the march, the 3-inch antiaircraft gun is of practically no use whatever, since the gun must first go into position before it can fire. The same is true of the 37-mm. gun. On the other hand, unless the 3-inch gun is present for the defense of the bivouac area, the force is likely to be wiped out or seriously damaged. It is believed that a battery of 3-inch guns should be included in a mechanized force for this defense. A 37-mm. gun battery is not a necessity, but makes a very desirable supplementary defense.

For the defense of the moving column, antiaircraft machine guns are a necessity. The only question which arises is whether these guns should be distributed to the various units to allow them to maintain their own defense or whether these guns should be grouped together as an independent unit. From an administrative standpoint, such questions as maintenance and ammunition supply would be better handled if the machine guns were controlled as a unit. From a tactical standpoint, the operation of the defense would be better, since the training of the men would be more uniform and the disposition of the guns throughout the column would be controlled by one head. The commander of the antiaircraft unit should be the antiaircraft defense commander of the mechanized force and should be responsible at all times for the disposition of the guns, machine guns, and searchlights of the antiaircraft defense.

Suggested Organization of Antiaircraft Unit for Mechanized Force

The following is merely a suggested organization for the antiaircraft unit of a mechanized force of about 400 vehicles, which would occupy a road space of about 12 miles. All cargo and towing trucks of whatever size for this unit

would be Coleman 4-wheel pneumatic-tired trucks, which have high road speed and good cross-country ability under full load. The Coleman 3-ton truck is chosen as the prime mover of the 37-mm. gun. It is believed that this will prove satisfactory. The 3-ton truck is also chosen for the prime mover of the light trailer carrying the .50-caliber quadruple mount. The 1½-ton truck would undoubtedly be satisfactory for towing, but the 3-ton truck allows more room for the range instruments and ammunition.

The term cross-country towing car is used. This refers to a stock model touring car, with a truck transmission and oversize balloon tires. Such a car is cheaper to produce than the car with the special cross-country body, does not weigh materially more, and has the same mobility, provided the top can be folded back when passing under low hanging branches. It also gives protection to the occupants from rain and sun and is more comfortable to ride in.

It is not known at this time whether it is contemplated to have an ammunition train in the mechanized force which would supply all ammunition for the force, including antiaircraft ammunition. For this reason spare ammunition trucks are included.

One tractor is included in the gun battery for use in emergencies, such as pulling out stalled trucks in swampy ground. This should be a caterpillar 30, a tractor which weighs the same as the 5-ton Holt tractor and is half again as strong.

The motorcycles included are cross-country Harley-Davidsons with balloon tires, which were tested during 1928.

1. Searchlight Section.
   - 4 Searchlights on Cadillac trucks.
   - 2 Trucks with sound locator.
   - 2 5-ton trucks for rations, baggage, and spare parts.
   - 1 Cross-country touring car.
2. Machine-Gun Section.
   - 12 3-ton trucks with quadruple-mount .50-cal. machine guns on trailers.
   - 6 3-ton trucks, spare ammunition.
   - 4 3-ton trucks, rations and baggage.
   - 1 Cross-country touring car.
3. Gun Section.
   - 10 5-ton Coleman trucks (4 to pull gun trailers, 1 for instruments, 2 for spare ammunition, 2 for rations and baggage, 1 to pull tractor).
   - 1 Cross-country touring car.
4. 37-mm. Gun Section.
   - 10 3-ton trucks (4 to pull gun trailers, 1 for instruments, 2 for spare ammunition, 3 for rations and baggage).
   - 1 Cross-country touring car.
5. Maintenance Section.
   - 2 1½-ton light repair trucks.

2 Tank trucks.
2 Kitchen trailers.
2 Water trailers.
2 Cross-country motorcycles.

CONCLUSIONS

1. The mechanized force, by reason of its value, is sure to be a target for hostile aerial activity.

2. When on the march, the mechanized force is liable to attack by low-flying planes swooping over the column and should be defended by .50-caliber, quadruple-mount machine guns on mobile mounts.

3. When in bivouac area, the mechanized force is vulnerable to bombing attack from high altitudes and should be defended by 3-inch antiaircraft guns; 37-mm. guns would make a very desirable supplementary defense.

4. On the battlefield, antiaircraft guns and machine guns can afford protection against both bombing and low-flying targets, and can also engage land targets in emergencies.

5. An effective antiaircraft unit in a mechanized force should include searchlights, 3-inch guns, 37-mm. guns, and .50-caliber machine guns, and should be placed under an antiaircraft defense commander for the force.

6. The primary mission of the antiaircraft artillery with the mechanized force should be to protect it from hostile aerial activity at all times, to guard it from casualties from the air, both when the force is stationary and moving, and to enable it to arrive unmolested to accomplish its mission on the battlefield.

The individual is taught the principles of our government, and the obligations and duties of citizenship. I would that every young man might have these advantages, and believe that in no other way may the foreign boy so quickly learn Americanism.—**Gen. John J. Pershing.**

The Army Mine Planter Service

By Captain H. F. E. Bultman, C. A. C.

THE Act of Congress of Februery 2, 1901, which authorized the organization of the Artillery Corps with a chief, assigned as one of the duties of this new corps the development, installation, and operation of submarine mines for the defense of harbors. Prior to this time, submarine mining was a duty of the Corps of Engineers. Shortly after the organization of the Artillery Corps, the School of Submarine Defense was established and the Torpedo Board was constituted. Both of these were concerned with the development and installation of submarine mines and in carrying on this work they soon discovered the need for specially built and equipped vessels with trained personnel for mine planting.

Through the energy and foresight of General Randolph, Chief of Artillery, and Major Murray, then Commandant of the School of Submarine Defense, authority and funds were obtained in 1903 for the construction of four vessels to be specially designed, built, and equipped for mine planting. These vessels, which were constructed in accordance with designs furnished by the Torpedo Board, were completed and put in service in 1904. One of these was assigned to the School of Submarine Defense at Fort Totten, New York, for exclusive use there for submarine mine instruction and experimentation. The other three mine planters were used to give instruction in planting and maintenance of submarine mines in the different Artillery Districts along the Atlantic and Gulf Coasts.

The need for planters for the Pacific Coast and the foreign possessions was soon recognized but nothing was accomplished in this matter until General Murray became Chief of Artillery. He, who was probably the best informed officer at that time on submarine mining, stated that experience had shown that mine planting could be done efficiently and successfully only by having vessels specially fitted and crews specially trained and practiced in mine-planting operations. Recognizing, however, that authority and funds could never be obtained to have sufficient mine planters to plant all projects immediately upon declaration of war as would be necessary in order to protect our harbors, General Murray began to look for suitable vessels that could be obtained to supplement the mine planter service. In the summer of 1907, arrangements were made to supplement the mine planter service with the vessels of the Lighthouse Service when these were turned over to the control of the Navy at the beginning of war. All equipment necessary to make these vessels suitable for mine planting was purchased and stored in places convenient to the location of each lighthouse tender where it is readily available. These vessels are to be used for the initial planting only, the maintenance to be done by the regular planters.

The necessity of having more mine planters was still very evident and authority and funds for four more were obtained. These four were similar in

construction to the first four built. They were completed in 1909 at a cost of $175,000 each. This made a total of eight vessels in the mine planter service in 1909. The four new planters were kept for service on the Atlantic and Gulf Coasts and the four older ones were sent to the new stations, two going to the Pacific Coast by way of the Straits of Magellan and two to the Philippine Islands by way of the Suez Canal.

There was no increase in this service again until 1917 when the *Graham* was built and put in commission. In 1918, two cable ships were taken over from the Signal Corps and added to the mine planter service. The big increase came through within the next two years when nine additional planters were authorized and built at a cost of about $750,000 each. These were completed during the fall of 1920 and brought the total at that time up to twenty vessels.

All of these vessels were kept in commission until 1922, although there was comparatively little activity connected with submarine mining for them to engage in. With the reduction of the Army in 1922, the mine planter service was dealt its hardest blow. The number of planters was reduced from twenty to eight in commission and one in reserve. The eleven surplus vessels were disposed of in various ways. Several were sold to commercial concerns, some were turned over to the Lighthouse Service and remodeled for use as lighthouse tenders, and one was turned over to the Coast Guard for use as a cable ship.

There has been no change in the vessels in service since 1922 and the eight now in commission are the *Armistead*, built in 1904 and now assigned to the Harbor Defenses of San Francisco; *Ord* and *Schofield*, built in 1909 and assigned to the Harbor Defenses of Sandy Hook and Chesapeake Bay, respectively; *Graham*, built in 1917 and assigned to the Harbor Defenses of Cristobal; and the *Baird*, *Bell*, and *Harrison*, built in 1920 and assigned to the Harbor Defenses of Long Island Sound, Puget Sound, and Manila and Subic Bay, respectively. The *Henry*, which was taken over from the Signal Corps, while assigned to the Harbor Defenses of Sandy Hook, is detailed on signal cable duty and works whenever needed.

When the mine planter service was started in 1904, the personnel of each planter consisted of the commanding officer who was an artillery officer, assigned by the War Department, a detail of Artillery Corps enlisted men, and the crew of the vessel consisting of deck and engine department personnel, who were civilians. The commanding officer was in charge of the vessel and all personnel, the command of the civilian crew being exercised through the master. The Artillery Officer was also the Finance Officer, Supply Officer, Personnel Officer, and Officer charged with supervising mine planting and instructing the personnel of the mine commands during the time the planter was at a coast defense for submarine mine work.

The enlisted detachment had charge of and operated the mine-planting gear on the planter. They were under the direct command of the commanding officer for all purposes. The civilian crew operated the vessel and were under the direct control of the civilian master. There was no change in the status of any of this personnel from the time of the organization of the service to 1918.

Because of the fact that the mine planters are essentially a military unit and frequently engaged in work of a confidential nature and since the civilian crews had never proved entirely satisfactory, the Chief of Coast Artillery recommended in 1916 that legislation be passed authorizing the militarizing of the crews of these vessels. This was done in 1918 and was a most beneficial change. At that time, a special classification designated as Warrant Officers, Army Mine Planter Service, was organized with an authorized strength of one hundred. These warrant officers were divided into five grades: masters, first mates, second mates, chief engineers, and assistant engineers. This classification corresponded to the warrant officers authorized and needed for each planter, and the number authorized provided for five warrant officers each for the twenty mine planters which were then in service or being prepared for service. The personnel for this service came from the civilian crews of the mine planters, who were given an opportunity to come into it as warrant officers in the grades corresponding to those which they then held as civilians, from civilians who passed the required examinations, and later from graduates of the Nautical School which was conducted at Fort Monroe, Virginia. The other members of the crews, other than the warrant officers, were obtained from the enlisted men of the Coast Artillery Corps.

The number of Warrant Officers, Army Mine Planter Service, which was authorized remained at 100 until 1922 when, with the reduction of mine planters in active service from twenty to eight, the number of warrant officers authorized was reduced to forty to correspond with the number needed for the planters kept in commission. At that time, all warrant officers in all grades in excess of the forty authorized were completely discharged from the service without being granted any allowance or considerations of any kind. This was soon recognized throughout the service as a great injustice to these men, many of whom had years of service in various other service capacities and finally, after about four years of waiting, Congress passed an Act giving them the same corresponding compensations that had been given the officers who had been discharged when the size of the Army was reduced in 1922.

That the change from a civilian crew to a military crew was a great step forward should be very plainly evident to anyone who has had the opportunity to compare the services rendered by the mine planters today with that rendered by the other vessels of the Army with which Coast Artillery personnel have to deal.

Mine planters are performing willingly, efficiently, and satisfactorily every conceivable kind of service whenever and wherever requested. A large part of the credit for this is due to the warrant officers, who are really the "Backbone" of the service. These men are the equals professionally of the civilians who hold similar positions on the other Army vessels and the extension of a similar service to include the crews of all vessels operated by the Army would undoubtedly prove of as much benefit to these as it has proved to the mine planter service.

The crews of the mine planters now consist of one commissioned officer, five warrant officers, and twenty-one or twenty-four enlisted men. These are all

assigned by the Harbor Defense Commander under whom the vessel operates. The three additional men are allowed for the vessels burning coal. In line with reductions throughout the Coast Artillery, the size of the crews of mine planters has been reduced until it has reached its present size. That such a crew is entirely too small for such a vessel can be seen by comparison with the crew of one of the smaller planters which was turned over to the Coast Guard. This vessel which was formerly the U. S. A. M. P. *Mills*, now the C. G. *Pequot*, is now performing duties quite similar to those performed by mine planters. The *Pequot* has a crew of 44 men, none of whom are paid less than $30.00 a month. The mine planter located at the same place has a crew of 21 men, over half of whom are privates, whose pay is $21.00 per month. That the planters are performing so satisfactorily under such conditions should be ample proof of the satisfaction of service crews for the Army Mine Planter Service.

When the Mine Planter Service was first organized in 1904, the development of submarine mining was occupying a considerable portion of the efforts of the Artillery Corps. The destruction to navy vessels wrought by the mine fields at Port Arthur, Dalney, and Vladivostok during the Russo-Japanese War served to center the army's attention on the importance of this method of defense. This interest in submarine mining was kept up for many years. That faith in submarine mining as a powerful means of defense was still great at the beginning of the World War can be seen from the fact that mine commands throughout the service were kept intact for a long time after the other Coast Artillery organizations had been broken up to form new units. During all this period, mine planters operated under the direction of the Chief of Coast Artillery and performed mine work exclusively.

The interest in submarine mining was beginning to wane however and by the end of the World War these mines were receiving very little of the time of the Coast Artillery.

About this time, the mine planters were assigned to Coast Defenses and were made available for any kind of artillery work. This continued until 1924 when a change in the regulations governing the mine planter service made the planters available for *any* kind of duty when they were not needed for artillery work. Since then, they have been used for almost every conceivable purpose. In most cases, especially when the demand for vessel service is great, the planters have been made available for artillery and mine work only when some other activity of the Harbor Defense did not have use for them.

The decline in submarine mine work has been noticed by the Office of the Chief of Coast Artillery and orders were issued this year stressing the importance of again taking up this work in earnest and requiring the planting of full groups of nineteen mines instead of the haphazard planting of small fractions of these groups that has characterized most of the practices of the last five years.

It is to be hoped that with a renewal of interest in submarine mining, the mine planters will again be released to the duty for which they were originally authorized and will be able to develop that efficiency and spirit of which they are capable if given a chance.

Converting the SCR-67-A

By Staff Sergeant J. C. Waddell, 59th C. A.

AT the present time throughout the various army posts of the United States, there are a great number of the radio telephone equipments SCR-67-A. This apparatus, already obsolete, is for the greater part unserviceable. However the set box BC-13-A, a component of this equipment, contains some excellent apparatus which deserves something better than to end in the salvage. For those who care to do so, these unserviceable sets offer a splendid opportunity for a little radio construction and engineering.

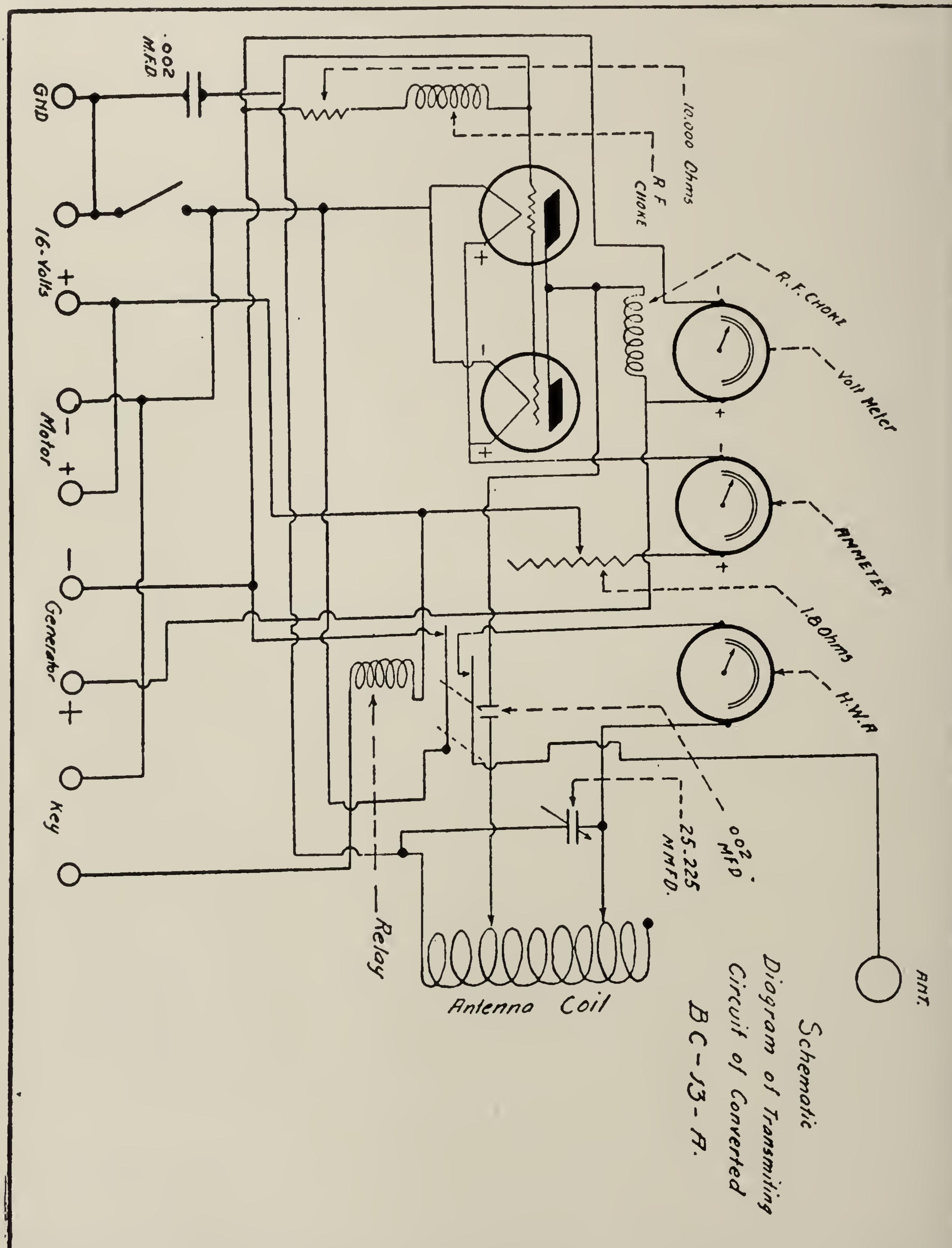
At Fort Mills four of these equipments were on hand and three of them were unserviceable. These sets could not very well be spared so it was thought advisable to make an attempt at converting them into useful apparatus. Authority was obtained for the conversion of two of the equipments as a starter and the work has been completed. In view of the good results obtained it is thought that a description of these sets, as well as the manner of converting them, may be of interest to others who would care to undertake some of this work for themselves.

The completed set is a ten-watt C. W. transmitter and radio telephone combined and incorporated on the same panel with a three-tube regenerative receiver. The transmitter occupies the upper part of the panel and the receiver the lower. The transmitting wave is from 300 to 850 meters when using an antenna 100 feet long, while the receiving wave is from 300 to 1100 meters. In converting these sets two things were aimed at primarily, simplicity of construction and ease of operation. Upon test the sets were found to oscillate readily over their wave bands, that the C. W. note was sharp and clear, and that the voice modulation was fair. It was also found that the sets would oscillate on an antenna 40 or 50 feet in length, which makes them ideal for target practice work where it is desired to install radio equipment on small boats. Also, the system of keying through a relay makes it possible to work duplex when using only a single antenna. The best radiation obtained was .98 ampere when using a fully charged 16-volt battery. It may be well to mention right here that the only expense is the cost of the panels, which are hard rubber 24 x 24 inches. Of course, a smaller size may be used if desired.

While the accompanying illustrations are more or less self explanatory, a brief description of some of the parts that must be built by hand may be of advantage. It will be noticed that the transmitting hook-up is a Hartley, almost idential with the C. W. circuit of the SCR-109 transmitter. All the necessary parts were taken from the BC-13-A set box with the exception of the transmitting inductance and the two fixed condensers.

The transmitting coil was built in the following manner. A solid wooden form was secured, 4¾ inches in diameter by 6 inches long. A piece of flexible

red fiber of sufficient thickness was then cut to fit the form, bent into position, and the ends fastened down with friction tape. Fifty-six turns of No. 14 DCC magnet wire were next put on, 13 taps, counting both end ones, being taken off.

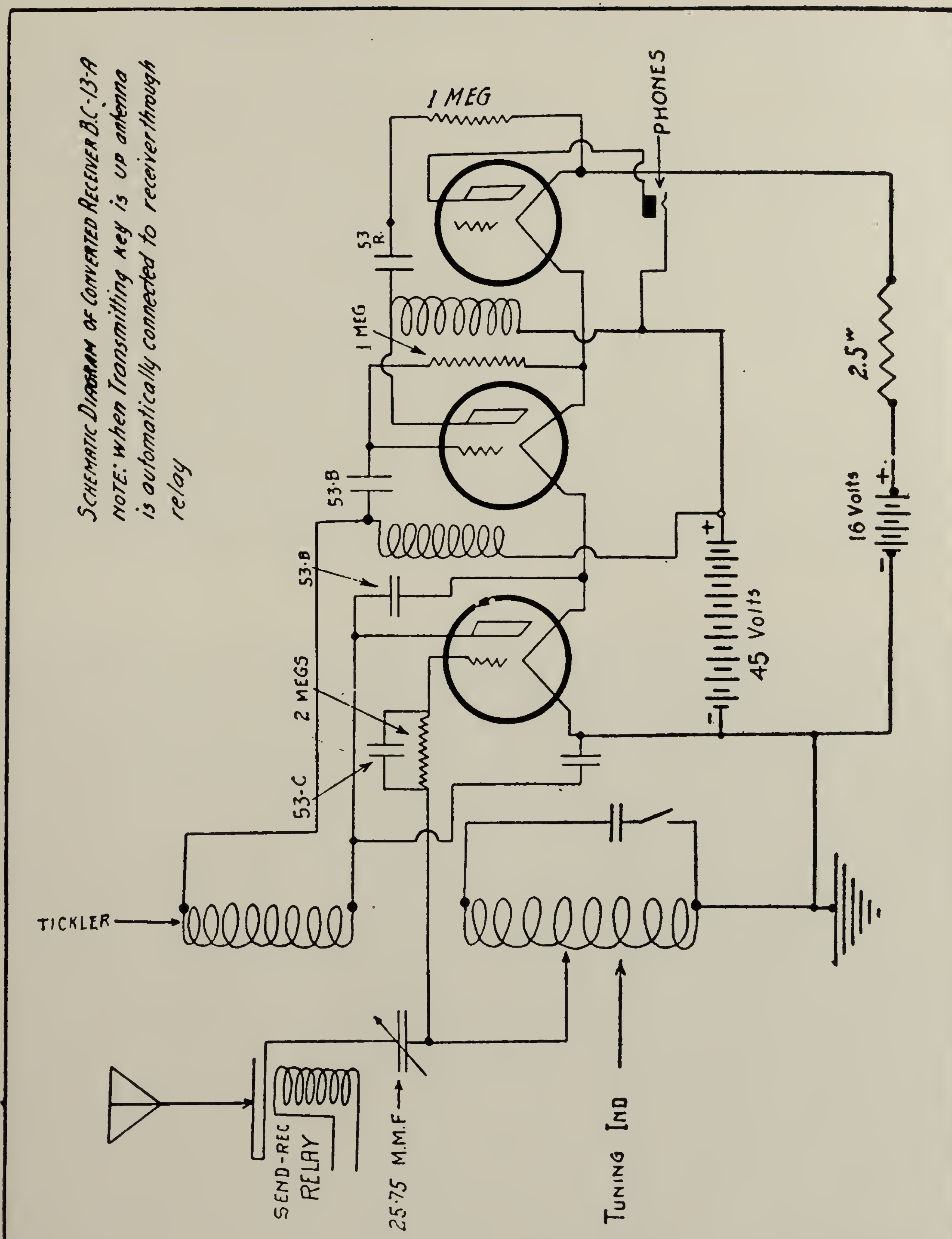


Schematic Diagram of Transmiting Circuit of Converted BC-13-A.

After the wire has been put on and fastened at the ends, the coil is ready to slip from its form. A good coat of shellac, both inside and out, finishes it.

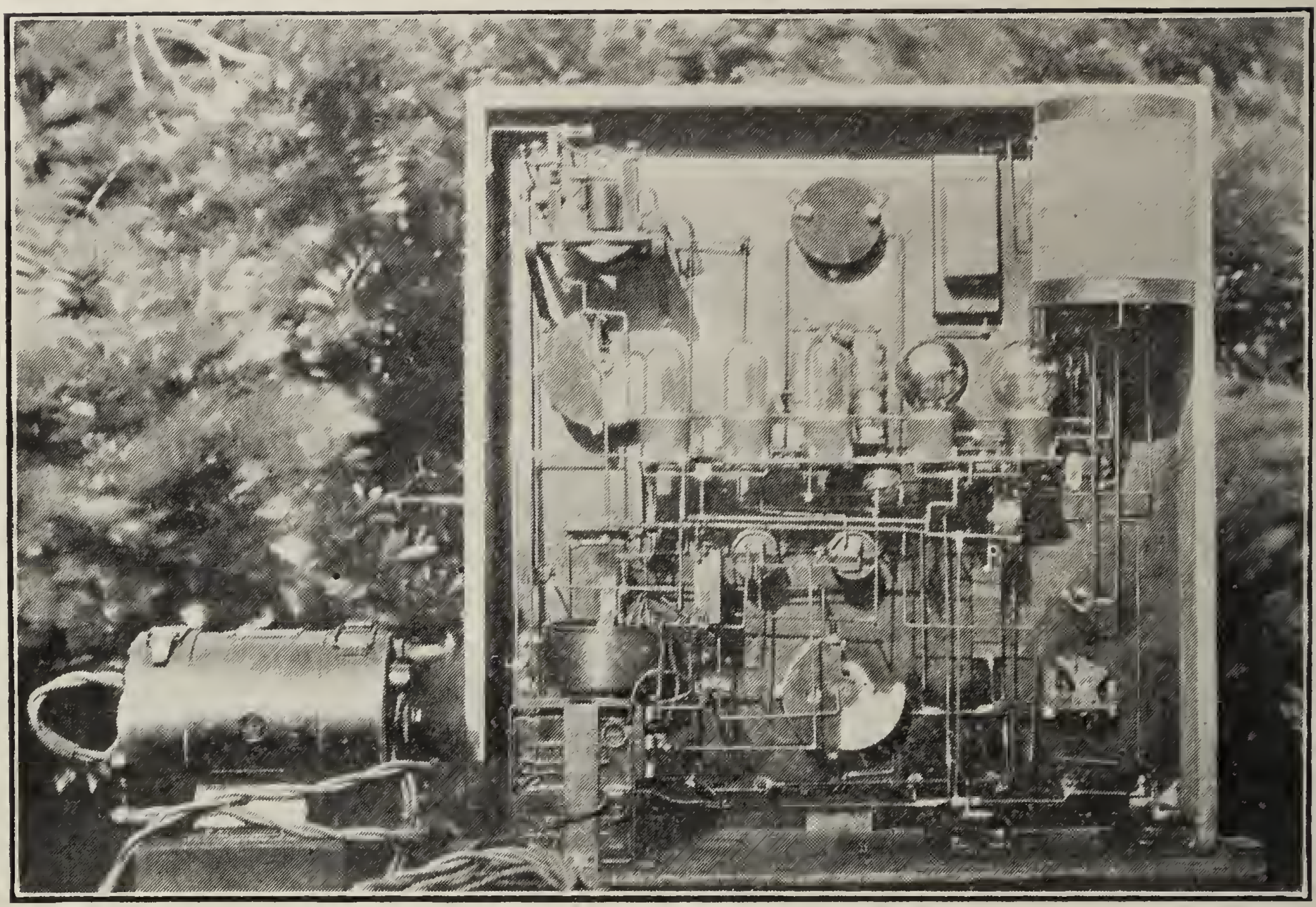
The best values of capacity for the plate and grid coupling condensers is about .002 mfds. These condensers were formed of 19 plates each, their dimensions being 2½ x 1½ inches. The plates are cut from thin copper or

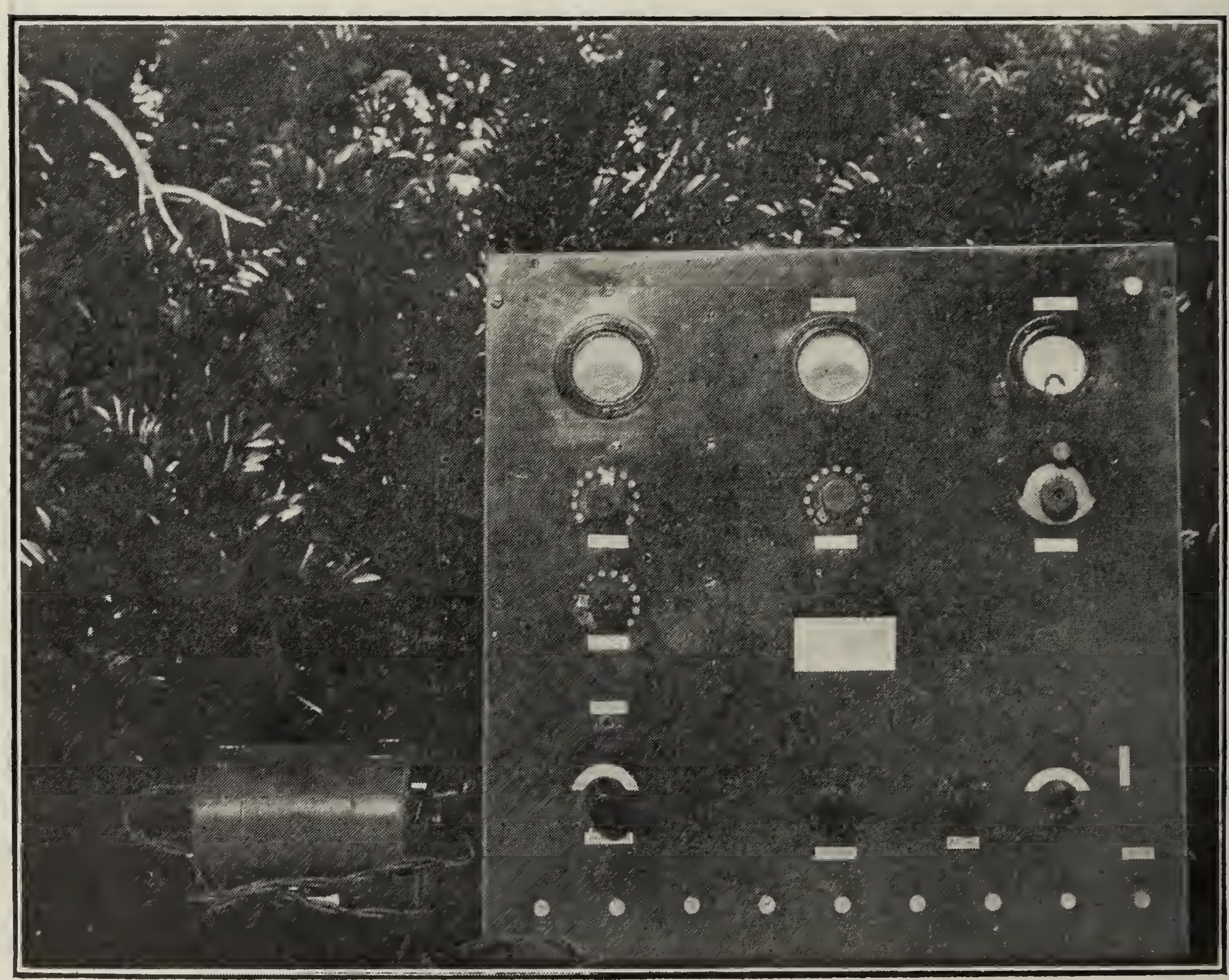
brass and separated by mica dielectrics slightly larger than the plates. The assembled condensers are firmly secured by any rigid insulating material and the ends of each section soldered to insure good electrical connection. In



soldering, be careful to use rosin core, as acid flux, when hot, will spread to the plates, completely ruining the condensers.

It will be noticed that the key is in the relay circuit which in turn makes and breaks the plate circuit as well as the antenna circuit. When the key is down, the negative 500-volt circuit is completed and the antenna is connected to the





transmitter, but when the key is up oscillations cease and the antenna is automatically connected to the receiver. In this way duplex is secured when only using a single antenna. This system worked well as long as the received signals were strong and in most cases should be ideal for target practice where the distances covered are not great.

The receiver is of the single-circuit, regenerative type. This circuit was adopted because of its efficiency and stability and because the receiving parts taken from the BC-13-A lend themselves readily to this type. The hook-up is about the same as the original except the plate circuit is broken and leads through the tickler coil for regeneration. Also, the small individual resistances in the filament circuit are omitted and replaced by a fixed resistance of 2.5 ohms placed in the positive lead. If a small rheostat of 3 or 4 ohms resistance is procurable it will be better yet. The small condenser across the primary coil may be either included or excluded from the circuit and will increase the wave length of the receiver if desired. Also, the small condenser connected between plate and filament will insure oscillation for regeneration.

The illustration will show that all meters, including the voltmeter and its multiplier from the power board BD-1-A, are mounted at the top of the panel. This is merely for convenience and appearance. The dynamotor was also removed from its frame and mounted on a block of hard wood in whose base the smoothing-out condensers are mounted. These condensers are connected across the generator armature. Number 9 or 10 bare copper wire should be used throughout for wiring and if sufficient care is taken in the mounting and wiring up of the apparatus an efficient and neat appearing set will result. It is believed that if more interest was taken in this sort of work throughout the army and if more of the broken down and unserviceable radio apparatus was converted into useful sets, instead of being salvaged at a total loss, that the saving and benefit to the government would be considerable.

Military training teaches the poorer boys, who have not the training in athletics provided by the expensive preparatory schools and the colleges, the value of physical training, personal hygiene and health.—**R. S. Lovett, Chairman Executive Committee, Union Pacific Railroad.**

Permanent Squad and Platoon System for the National Guard

By Capt. Geo. A. Patrick, C. A. C.

Reprinted from the *Palmetto Guardsman*

A SHORT time ago, while discussing with an organization commander the desirability and practicability of organizing a National Guard unit on the squad system and training it on decentralized principles, I was informed that it had been given a trial and would not operate satisfactorily in the National Guard by reason of the irregular attendance of the men and the large turnover in personnel.

Believing firmly that such organization and training can be made to operate effectively, I suggested a method for his consideration and because of my belief in the method it is presented below for the consideration of other National Guardsmen who may be interested in the subject.

First will be presented the principles, methods and system of training prescribed in training regulations and then will follow the method by which it is believed they may be applied effectively in a National Guard unit.

Principles of Training

All training should be founded upon the principle of stimulating and developing the national characteristics of initiative, self-reliance, and tenacity of purpose, and so molding those characteristics that they will at all times be responsive to the lawful direction of a superior. This demands that each individual be developed to the greatest possible extent, physically and mentally, and acquire the greatest possible efficiency in the specifications of his grade; that he be instantly responsive to the demands of constituted authority, and that he learn how to function in his team. An important feature of every phase of training is instruction in the art of how to train others.

Methods of Training

Whatever method is used it should be progressive, should have a definite objective which is to be obtained in a minimum of time, should be executed on decentralization principles, and should employ the applicatory system in all possible cases.

The duties of each individual and unit should be analyzed into their component parts, and these parts arranged in logical progression. Standards of proficiency, based on time and quality of performance, should be prescribed and, generally, training should not be started in an advanced group of these

component duties until the minimum standard of proficiency has been acquired in the elements preceding.

Precision and exactness should be demanded, especially in mechanical operations, speed and celerity being acquired with practice. Movements of a purely mechanical nature should be practiced until their accurate and speedy execution becomes second nature even under the most adverse conditions. Training should be varied, and repetition should never be carried to the point of physical and mental exhaustion.

Every phase of training should have a well-defined objective thoroughly understood by those undergoing the training, and training for that objective must be conducted with energy and intelligence. Every act must have a well-understood purpose, and its relationship to the whole object of training, whether in study, drill, or practical application of principles and methods, must be inseparable.

The standards set for proficiency should be obtained in a minimum of time, not only as an economic measure imperative in time of war, but as a factor largely influencing the morale and initiative of the individuals undergoing training.

The applicatory system should be employed in all training. All the elements entering into a solution of the problem in actual combat should be presented and an opportunity given to apply to the situation the appropriate principles and methods.

System of Troop Training

Troop training is the preparation of individuals and units for battle, and involves study, drill, and practical application. It is a function of command.

Supervision, coordination, control of, and responsibility for the training of any command, including production of the necessary specialists, is vested in the commander thereof. The responsibilities of a commander for the training of his command extends to every individual and unit thereof, but the method employed by each commander in fulfilling this obligation will not extend to the actual conduct of training within the unit of a subordinate, but only to the supervision thereof, leaving to the commander of each subordinate unit full authority within the sphere of his activity and holding him to a rigid responsibility for results.

The character of the organization or unit, large or small, as indicated by its reason for existence, will determine the subjects in which proficiency is required.

In addition to the preparation by study as required by the commander, it is the duty of every officer and noncommissioned officer to devote himself, by individual application, to the acquirement of accurate knowledge pertaining to the requirements of his special office or position and to so much of the duties of others as will assure intelligent cooperation.

Programs and Schedules

It is the duty of the commander of every unit to prepare programs of training for the next lower units of his command and a schedule of training for his own units based upon War Department orders, the training orders of his tactical superiors and the present stage of training of the unit for which it is intended.

These programs and schedules should state the standard of proficiency to be attained at one or more stages of their course. The schedule prepared by each commander for his own unit, and the programs prepared by him for the next lower units should be carefully studied by the next higher tactical commander and necessary revisions ordered.

In peace, the period of time covered by programs and schedules will generally diminish from higher to lower units. In time of war, the same principles will apply, but training will be intensified, and programs and schedules issued frequently to accommodate rapidly progressing organizations.

Inspection

Inspection is a function of command and should be frequently made by commanders of every grade and their staff officers, to satisfy themselves that programs are being followed, that approved doctrines, principles, and methods are being used, and to test proficiency. No individual or unit should be tested, or a demonstration demanded therefrom requiring proficiency in advance of that required in its program, except upon application of the individual or the commander of the unit concerned.

Methods of Instruction

Any complete scheme of instruction logically divides itself into four phases: preparation, presentation, application, and examination. Much preparation is necessary before a subject can properly be presented by an instructor to his class. The presentation is the larger part of the actual instruction. The subject having been presented, students should be given an opportunity of practicing what they have learned by some form of application; after these three steps the student usually undergoes a test or an examination. At times it may be necessary to omit the third step "application." For example, in military hygiene the student rarely has a chance to employ or practice his knowledge before taking an examination.

Preparation

Under the heading of preparation there are several steps: first, "the mission," *i. e.*, to determine the purpose and scope of the subjects to be taught; second, "the estimate of the situation," *i. e.*, to determine the relative importance of the subjects, the time available for each, the effect of the season of the year, etc.; and third, "the decision" which takes the form of a definite program or schedule.

The matter of preparation applies all the way down to the noncommissioned officers who must understand what it is all about and what their part is in the scheme before they can be effective instructors. The first essential for an instructor is that he thoroughly understand the subject himself and the primary purpose of the noncommissioned officers' schools should be to instruct the instructors how to instruct.

Presentation

As previously stated the presentation is the larger part of the actual instruction and it is the most important, also. One of the secrets of effective instruction is simplicity. Simplicity of method and simplicity of language. A good instructor makes a difficult subject appear simple; a poor one makes a simple subject seem difficult. We cannot gain simplicity unless we are clear in our expression to the point of being unmistakable.

The method of presentation should be as follows: first, define or state what it is all about; next, amplify these statements making free use of the rhetorical devices of comparison and contrast; and finally, illustrate the subject by an appropriate narrative story of an actual experience, by reference to a chart, a picture, or a landscape target, or by a demonstration, which consists in actually doing before the class the subject which is being explained.

Application

There are several general methods of application, one of the most important of which is competition. The psychological factor is of great value in the application step of instruction, and should be used to its full advantage. Individual competition, competition between squads, platoons, companies, and battalions should be employed whenever possible. Students should be encouraged to ask questions. No sincere question should be disregarded by the instructor, for no matter how foolish it may sound, it will serve to drive home the point under consideration, better, perhaps than by any other method.

Practice without supervision is usually worse than no practice at all. It might be pertinent here to point out the difference between drill and instruction because it is only too often that units drill when they should be receiving instruction. Take for example two similar units executing close order movements. One unit is marched backward and forward for a period of a half hour and all the movements prescribed in the schedule are executed. Nothing is said by anyone except to give or repeat the necessary commands for the movements. This is drill and is of benefit to the unit only after precision and exactness have been acquired by instruction and should only be participated in for the purpose of acquiring speed and celerity in the movements. On the other hand the second unit executes the same movements for the same length of time. Whenever the instructors see a mistake has been made the movement is stopped, the correct manner of execution is explained or demonstrated and the movment is executed again. This is instruction and at the end of the drill period real progress will have been made.

Examination

Examination may take the form of theoretical or practical tests. They may be oral, written, or executory. Questions must be clear, suggestive, and specific and should not require committing to memory data and statistics ordinarily found in reference works.

Having determined the principles, methods, and system of training required for the military service, the problem confronting the National Guard commander is to work out a scheme whereby he can put them into practical operation to insure having an efficient organization and still permit him to take a minimum amount of time from his regular business or profession.

Regulations require that in order to qualify for pay all national guard organizations must undergo instruction in uniform for one and one-half hours at least forty-eight times a year. It would therefore seem that an ideal scheme would be one that could be made to operate effectively without requiring the officers to devote more than forty-eight evenings a year to it.

The following scheme is presented not as an ideal solution of the problem but as a stepping stone toward attaining such an ideal.

The commanding officer of any organization is responsible for the instruction, tactical efficiency, and preparedness for field service of his command and for the proper performance of duties connected with its pay, clothing, accounts, reports, and returns. This does not mean that the commander performs all these duties himself. In fact, if he tried to do them all he would be hopelessly swamped and his subordinate officers would not get the training necessary for them to perform the duties of the next higher grade satisfactorily when the time for promotion comes.

The unit should therefore be organized for administration and training on decentralized principles whereby each subaltern is assigned certain specific duties in connection with administration and training and he should be held strictly responsible for results.

Organization for Administration

The efficiency of an organization can, in general, be fairly well estimated from the promptness and accuracy with which its paper work is handled. Reports and returns should be prepared, checked, and forwarded at the times prescribed. Monthly reports might well be prepared on the night of the last drill during the month and then mailed on the first of the succeeding month.

One subaltern should be put in charge of this routine office work. Under his supervision and with the assistance of the First Sergeant and the necessary clerks all rosters, accounts, reports, returns, and other paper work should be prepared for the signature of the commander and his initials on each paper should indicate that he has examined it and found it to be correct. He should remain at the armory after the conclusion of each drill until all paper work has been brought up to date.

Another subaltern should be put in charge of the arms, equipment, and other property issued to the organization. He should adopt or devise some system of property accounting and record keeping so that the exact condition of the property may be determined at any time by inspection of this record.

A physical inventory should be made at least once every six months and any shortages found should be charged on the next payroll against the men losing same or a report of survey should be initiated. If the property is systematically arranged and the records are properly kept it will not require a great deal of time to make the inventory. Blank forms should be provided for corporals to check the clothing and equipment in the hands of the members of their squads, and for platoon leaders to check the property in the hands of the Sergeants and Corporals. All property should remain in the armory so that the clothing and equipment issued to men who are absent on the night of the inventory may be checked in their lockers.

Organization for Training

Organization for training requires careful and intelligent planning on the part of the commander. Subalterns should be assigned definite duties in connection with the tactical training of the unit.

The outcome of this planning is the preparation of a training program or schedule covering a certain phase of the training. Without a detailed training schedule it is hard to conceive how any unit can make sure and steady progress. Schedules, in general, should not cover a longer period of time than three months, and should show the details for each drill, as, for example:

Time Min.	*Subject*	*Troops*	*Place*	*Method*	*Text*	*Instructor*
60	School of squad	All	Armory	App.	Pars. 1-12, T. R. 420-50	Cpls. under close supervision of Sgts. and officers
30	First aid	All	Armory	Lecture	Pars 4-9, T. R. 112-5	Lt. Jones

At the conclusion of each phase a test or inspection should be given to determine whether or not the objective has been attained and what corrective measures, if any, should be applied. Credit should be given for proficiency on the organization training chart mentioned below.

Schools

Officers, noncommissioned officers, and specialists schools should be held each drill night, the officers and noncommissioned officers being required to report ahead of the time scheduled for assembly.

It is believed that the officers' schools will be more effective if they take the form of appropriate army correspondence courses. It is surprising how quickly a course may be completed if only a little is done on a lesson each week.

Noncommissioned officers' school should be conducted by one of the officers, each officer taking a turn. The primary purpose of this school is to teach them

how to be effective instructors. It is better to have the school precede the drill rather than follow it.

The officers conducting the school should have a copy of the drill schedule for the night and should announce what the instruction is to consist of. He should then explain the movements to be covered and then call on different members of the class to demonstrate how he intends to put the instruction across, using the other members of the class to practice on. Incorrect methods of instructing should be pointed out and the correct method explained.

Specialists' schools should consist of having them study or practice their specialty either with or without supervision as deemed necessary. It should be carried on concurrently with the regular drill or instruction.

Squad and Platoon Organization

Every member of the organization should be permanently assigned to a definite squad or platoon. Platoons may be classified as "regular," "reserve," and "recruit." The size of the platoons will depend upon the strength of the unit, the number of recruits, and the number of men who are regular attenders.

Regular attenders are assigned to squads in the "regular" platoons. Irregular attenders are assigned to the "reserve" platoon, and recruits are assigned to the "recruit" platoon. This recruit platoon should be put under charge of the best drillmaster in the organization regardless of his grade and the members should not be assigned to "regular" or "reserve" platoons until they have completed and successfully passed tests in the subjects enumerated in "Recruit, Instruction, National Guard." (W. D. M. B. Document No. 912, 1925.)

When the unit is formed, all men fall in according to their permanently assigned places in ranks leaving the places of absentees blank. After the roll is called any squad in the "regular" platoons without a corporal is broken up and the men are used to fill in the blank files of the other squads. The members of the "reserve" platoon may also be used for this purpose or additional squads may be formed.

It is believed that some such system will tend to cause the squad and platoon leaders to take a more vital interest in their squads and platoons and make them realize more fully that they have responsibilities as instructors and leaders of units. Also that it will promote efficiency and team work as the same men will, as a rule, always be grouped together and recieve instruction from the same person.

A training chart as shown in Appendix II, Notes on National Guard Training, 1925-1926, is a very satisfactory means of keeping a record of such organization up to date. The chart is much more satisfactory if constructed out of blackboard material having the divisions and headings of the columns painted in white.

The competitive spirit should be fostered between squads and platoons, and frequent competitions should be held. Attendance, appearance, and proficiency

should all be given relative weights in determining the winner of a competition and some suitable award or prize should be given.

Every absentee, or man reporting late, should be interviewed by the commander and if the explanation given is not satisfactory appropriate disciplinary action should be taken. Any funds accruing from this source might well be utilized to provide prizes for the competitions.

The instructional value of the free use of charts depicting various formations or movements is considered worthy of mention. Relatively few men in any organization know the exact position each unit or man should occupy in any given formation. However, if there were a chart on the wall showing the exact position of each unit or man in a particular formation it is believed that natural curiosity would cause a large number of men to inspect the chart while they are standing around and thus they will pick up a certain amount of information that they otherwise might not get. In addition these charts are valuable during lectures, etc., and may save a great many references to training regulations.

Summary

To summarize briefly, it is believed that the above scheme embraces the training principles of developing initiative, self-reliance, and team work; that it provides for a progressive method of instruction with a definite objective for each phase of training, organization on decentralization principles, and the use of the applicatory system; that it involves preparation of individuals and un'ts by study, drill, and application, and supervision, coordination and control by the commander; that the method of instruction is proper; and, last but not least, that it can be effectively operated if one night a week is conscientiously devoted to the matter.

The man who has received the training is a better citizen, is more self-respecting, more orderly, better able to hold his own, and more willing to respect the rights of others and at the same time he is a more valuable and better paid man in his business.—Theodore Roosevelt.

Dismounting and Moving Seacoast Guns and Carriages

By First Lieutenant Verne Snell, C. A. C.

OUR service is constructive and progressive. Each year this is impressed upon us as we see some familiar piece of fire-control equipment relegated to the scrap heap, or some theory or method of procedure which is supplemented by something new and up to date. We see our fixed armament becoming a thing of the past. The present trend is toward a service of mobile heavy armament and only those guns which are considered too heavy for a railway mount are permanently emplaced.

Due to changes in ship types, greatly increased ranges, deeper drafts, and greater speeds, some of our artillery posts are no longer necessary. The armament will serve no further use in place and so it is removed. The guns may be later returned to us on railway mounts.

We are taught the latest methods of handling and emplacing mobile guns. It becomes routine. If we are at a loss on some unfamiliar point we can study the texts and decide what is to be done.

There are no blueprints which show us how to remove the guns of a battery which is to be salvaged. We can find nothing in print to show us the details of the work to be done. No job sheet gives us a list of the materials. They have probably been in for more than thirty years and the men who put them in are gone. The work is generally to be done at a post where there are only a few caretakers and often these are retainers whose useful days are mostly of the past.

We have then in this problem a number of questions to answer before we can begin the work. How much blocking of various sizes do we need? How far do we have to haul the guns and what method will we use to move them? What is our heaviest piece and how many men are needed to maneuver it?

In seeking the answer one naturally tries to visualize the process of emplacing the carriages and mounting the guns. We can see in our mind's eye the stacks of cribbing making up the run way by which the piece of carriage was moved into place from the rear of the emplacement, and how the gun was later brought over the same trestle and gently lowered into its trunnion beds.

We possibly learn that the guns were brought up on a railway. It is now a streak of rust. We have a high hill on our path. Let us hope it is one to go up rather than down, because if tackle breaks, it is generally on the first heavy strain.

We find that it took months to put together the carriages, and that the working force was an artillery company or a large civilian crew.

The answer then looms large in time and men and, if the material is to be

taken out by the same methods as were used in placing it, the answer will indeed be large in terms of time, material, and men.

Let us, then, come down to a specific problem and see how the answer worked out.

Last spring I was ordered to proceed to one of our obsolete harbor defense posts, now garrisoned by Infantry, and estimate the amount of material, the number of men, and the time necessary to remove and ship two 3-inch guns and pedestal mounts, two 6-inch guns and parts of their disappearing carriages, three 10-inch guns and a great many parts from two of the later type carriages. The parts of the carriages which were not saved were to be sold for scrap.

I arrived at the post and found my assistant, an ordnance machinist who was familiar with the place and had done work of the same type, in fact had dismounted some of the same guns during the World War. In the caretaking detachment I found eleven men, only seven of them initially available. Of this detachment only one was an experienced Coast Artilleryman, the others being replacements from the Infantry. They knew how to apply grease and paint and knew a little gun drill but only one could tie a bowline or a becket. The narrow-gauge railroad on which the guns had been hauled from the dock to the emplacements was warped, ties rotted out, trestles down, and some sections missing altogether. The average haul to the dock was about one and a half miles, mostly over good roads. One bad hill could not be avoided and the guns had to be taken downhill. Last but not least to be taken into consideration was a Quartermaster who had seen the effects of hauling heavy loads over asphalt pavements with a tractor and who was very much, and rightly, worried about his pavements.

Supplies of materials were ample and included blocks of all sizes and timbers of various sizes and lengths, shingles, tackle, rope, a ten-ton trailer, a ten-ton tractor with capstan, and some 15- and 30-ton jacks in poor condition.

It was desired to use the current year's appropriations to pay the freight charges on the guns and carriage parts and the deadline was only two months away.

The initial estimate of the situation looked something like this:

a. Take out two 6-inch guns and haul to dock. Strip off parts of carriage. 2 weeks.

b. Take out two 3-inch guns and pedestal mounts and haul to dock. 1½ weeks.

c. Build sled to haul 10-inch guns. ½ week.

d. Roll out and haul three 10-inch guns to dock at three weeks per gun. 9 weeks.

e. Salvage base rings, rollers, racers, and some small parts from two 10-inch disappearing carriages. 6 weeks.

Making a total of nineteen weeks, or twice the amount of time available—this estimate predicted upon the assumption that at least twenty Coast Artillerymen would be added to the detail.

While waiting for the man-power question to be decided by higher authority, the small detail available started to work. The sled was built from 12 x 12 timbers, 3 feet wide and 12 feet long. The 10-inch guns were to be placed on this, one at a time, a roadway built of planks, and the gun moved by tackle and capstan by means of 8-inch rollers. This, of course, could not be done without a large detail to handle rollers and planks.

It was decided that the caretaking detail would be broken in on the 6-inch battery. About ten tons of blocking, tackle and timbers were hauled to the emplacement.

Cribs were built next to the front wall under the breech and muzzle, the gun being traversed until the breech was against the cement; 10 x 10 timbers were laid on a slant to the emplacement floor, the gun tripped, and trunnion caps removed. The gun was retracted enough to raise the counterweight off the floor, blocks placed under the weights, and the gun forced into battery again. The cribbing was then built up tight against the gun and the nuts taken off the suspension rods. The muzzle of the gun was then pried up until the trunnions were clear of the beds and then the top carriage, minus the gun, was retracted until the gun arms were down out of the way. Ropes were then rigged from an anchor, around the gun at muzzle and breech and to anchored capstans on the parapet. The gun was then slowly lowered by rolling down the inclined way until it was in position to load on the 10-ton trailer. To take out and load this gun required 2½ days. The tractor was then coupled to the trailer and the load soon landed at the dock and rolled off on timbers.

I decided that 2½ days was too much time to spend on one 6-inch gun, so planned to load the other gun from the parapet. The tractor took the trailer up and spotted it in position. Cribbing was put in about eight feet from the wall at the breech end and a light cribbing placed under the muzzle. The same procedure was followed in preparing the gun except that the timbers on which it was to roll were placed directly under it and took the weight as soon as the suspension rods were loosened. The gun was rolled up a slight incline by using the same principles as before. In this case only one rope was used. It went from a dead man to the gun at the trunnions, around the gun five or six times, then through a snatch block and to the tractor. It required 1½ days to land this gun at the dock, several hours of which were used in getting the trailer out of a bad hole in the road.

Several days were spent at this battery to take off the crossheads and parts of the tripping mechanism. The crossheads are held to the gun arms by two large pins, and to the suspension rods by two pins slightly smaller. All four of the pins are held in place by set screws set straight in on the circumference of the pin. These screws had been in place for thirty years. It was necessary to bore 50% of them out by means of a jig operated by hand.

The total time used at the 6-inch battery was two weeks, which was better than the estimate because for several days of that time only two or four men were available.

No particular problems presented themselves at the 3-inch battery. The guns and carriages were handled piecemeal by means of a shears, the two legs of a gin. The road leading to the battery was so slippery that we had to use an escort wagon with a short link to the tractor to haul the guns away. The work was completed in five days.

About fifty tons of block and timbers were now assembled at the battery of two 10-inch guns; both guns were rolled forward on the parapet. It was found necessary to use two 12-inch timbers in rear of the elevating trunnion band and a 10-inch timber in front of it. Even then the gun arms would not clear and the guns had to be rolled up 4 to 6 inches to clear the one gun arm. In this case a piece of light railway iron was used on the timber under the muzzle so that the muzzle could be slid along to keep up to the travel of the breech. This was necessary on account of the restricted space in which the elevating trunnion band travelled. The time used at each gun for building the cribbing, dropping the counterweights and gun arms, and rolling the gun was slightly in excess of one day. The weight of each gun was 34½ tons. Jacks were used for the first time on the second gun.

As mentioned before, the jack packings were not in working condition, not having been used in eight or ten years. These were replaced and the jacks filled with the compound now used, "Jack-O," alcohol prepared so it is not drinkable. The preparation ate up the leathers in three weeks time, so plain water was used. Hydrolene oil would be satisfactory in cold weather and would not rot the gaskets as quickly as "Jack-O."

Some time previous it had been decided that no men would be available to augment the detail until after September 1. It became a question then whether to mark time or continue on the carriages. In looking over the maneuvering material I had noticed timbers for a derrick—a mast 55 feet in height and 12″ x 12″ with a 10″ x 12″ boom 45 feet long. It was thought to be dryrotted, but the strength when new was so high I decided to get it out. About one thousand feet of ½ and ⅝ steel cable was located and some heavy blocks rigged. Five cables from the cap served as guys and were carried to trees in the vicinity of the battery. The derrick was raised by using the boom as a gin pole and the tractor as motive power. When in place the derrick was able to pick up a piece of carriage and lay it on the battery parade below or on the parapet above. On both carriages the gun arms, crosshead, and suspension rods were removed by pieces (total weight 7¾ tons). The counterweights were then lifted out and stacked up for shipment. The top carriage was freed of its brackets and pulled off to the rear. The webbing of the carriage side frames was taken out, the shafting driven out, and each side frame lifted away. The cement was chipped away from the joints of the racer and the racer lifted out in one piece (15 tons), as it was impossible to reach the bolts underneath with the racer in position. The racer was then stacked on the battery parade ready to ship.

Time on this carriage was 12½ days' working time. Time elapsed was much greater due to tractor breaking down.

On the next carriage the arms, head, rods, counterweight, and top carriage were stripped and the side frames loosened from the racer. When we tried to pick it up (about 20 tons) the cable slings and tackle broke and it was necessary to use 7-inch rope in place of the 5-inch which had sufficed up to that time. With a 7-inch rope and ⅝-inch cable slings carefully placed, the tractor picked the carriage up and it was set out on the emplacement.

The racer was removed as in the case of the previous gun. Time spent on this gun 6½ days, a saving of six days over the other gun, principally on account of the method of handling the carriage.

Next came the base rings weighing 20 tons each. The connecting flanges are embedded in the concrete of the emplacement and have to be drilled or blown out. T. N. T. was used with a large size electric cap. The battery power circuit was used to fire the caps. On one racer the holes were drilled from the inside of the well, and on the other the holes were drilled down from a point outside the racer. Both methods work, but boring from inside the well seems to produce a better job. Cement that stuck to the flanges was cracked off by using ½ to 1 block of T. N. T. at a time, the T. N. T. being packed against the cement with wet clay. About four working days were required on each base ring. They were taken apart in the emplacement and each piece lowered to the battery parade.

In the meantime we had inspected a number of heavy trailers used by contractors to haul steam shovels. They ranged in capacity from twenty to sixty tons. Prices were arranged, and this method of moving the three heavy guns promised a saving of well over a thousand dollars, and so the Ordnance Department gave us an initial allotment of three hundred dollars to cover rental.

Another tractor was shipped in to replace and supplement the one which we had been using. Bridges were built to accommodate the big trailer in getting onto and off the parapets. The third gun was rolled out and arrangements made to get the trailer. Then it rained. Roads were washed out. The cribbing under one gun was undermined and 34½ tons of gun went nearly out of sight in the mud. One week was spent in repairing the damage, and then the trailer was brought onto the job.

The trailer used was almost 32 feet long. Front axle on a fifth wheel and goose neck, two longitudinal axles in rear each mounting a transverse axle with a double wheel on each end, four expanding brakes on rear axle with a brake wheel forward on the goose neck. It had solid rubber tires all around. The platform was 28 inches from the ground. Clearance of side frames from ground, 6 inches. Rental charge, sixty dollars per day.

The trailer weighed 15 tons, gun 34½, blocking a ton or so, and two tractors ten tons each, making a weight of from sixty to seventy tons moving on our bridges at one time. Decking was 6-inch to 8-inch, with 10″ x 10″ beams resting on sills at the ends and blocked every six feet of their length.

The single gun was taken first; loading averaged about two hours. This gun had to be hauled over a morass of mud for over a quarter of a mile by

blocking the road and using a tackle and tractor capstan. It took over three days to go a quarter of a mile, and less than half a day to go the other mile and a half.

The other two guns were handier to a gravelled road and offered no particular difficulties. Six days sufficed (by working from 6:00 A. M. to 9:00 P. M.) to move all three guns to the dock and place them on timbers. Time, 6 days instead of 9 weeks. Detail, 7 men instead of 30.

The method of loading and unloading was in principle the same as that used in rolling the guns out of the trunnion beds, except that the dead end of the cable was fastened to the trunnion and given several turns around the gun and the rope end carried to the capstan. Twelve by twelve timbers were used for a track in rolling. In moving the muzzle to keep up with the breech a jack was set at a 45-degree angle which slid the gun along at a fair rate.

The method of taking this load of 50 tons down the hill to the dock was the same as used by the owner of the trailer in moving heavy loads. His motive power was two Mack trucks. We used a tractor on the front to haul, the other tractor and two trucks on the rear end to hold back. The weight on the road bed was slightly less per inch of cross section of tire than a five-ton Mack truck with a three-ton load. A 320° turn was negotiated in the center of the hill without difficulty. The shortest time taken to unload one gun was fifteen minutes and the longest about an hour.

The weights handled by this small crew in the space of three months, with a crew of not over seven men, were:

Blocking 100 tons.

Three guns at 34½ tons each, 103½ tons.

Two chassis with top carriages, piston rods, trunnions, and assembled gearing, 41 tons.

Base rings and racers, 39 tons.

Gun levers, crossheads, suspension rods, 15 tons.

Load counterweights, 112 tons.

Total, something in excess of 410 tons.

Thus was the old "block and jack" system done away with and seven men performed the work that formerly took a company.

Mechanization in Europe

By Major C. C. Benson, Cavalry

Editor's Note.—*The following discussion extends the field covered by the author's 1927-1928 articles on "Danger Zones." By arrangement between the author and the editors, this article appears in publications other than the* Coast Artillery Journal.

AFTER a decade of sensational aircraft development, military leaders abroad are apparently ready to come down to earth. Competition between private companies insures progress in the air, and army leaders can now devote more attention to equally important matters in other fields. The present urge is towards fighting machines for ground troops, as evidenced by improved tanks, gun carriers, and mechanized forces that have appeared in foreign armies. Tanks are now used in the armies of Brazil, Chili, Japan, Persia, and seventeen European nations. Some of these machines are relics of the World War; others, especially in Europe, are vastly improved new models which have resulted from rapid progress in the automotive industry. The new cross-country fighting machines combine sustained speed with tremendous hitting power, and provide armored protection for the crews. They promise to shift the emphasis in combat tactics from fire to movement; and as they far surpass the World War tanks, they will probably make good their promise. It may be of interest to examine some of the political, economic, and military considerations involved in the mechanization of armed forces in Europe.

We shall first consider the situation in Europe as a whole. Russia is alone; the continental countries are paired off in mutually distrustful combinations; and Great Britain, with the interests of her great empire at stake, exerts a powerful influence on all the others. The small Baltic states—Latvia, Esthonia, and Lithuania—have precariously maintained national independence; but they are essentially Russian, and if they become convinced of the stability of the Bolshevik regime, it would not be surprising to find them joining the Soviet Union. Germany and Austria have much in common, especially in their attitude towards France, and are drawing closer together. France maintains her cordial relations with Great Britain, and heads a group of smaller nations including Belgium, Poland, and the members of the Little Entente—Jugo-Slavia, Roumania, and Czechoslovakia. The power and prestige of France are indicated by her ability to preserve the Little Entente, which now serves as a check upon Italian ambitions in the Balkans. Italy, friendly with Great Britain but intensely jealous of France, has partially succeeded in aligning Albania, Hungary, Bulgaria, and Greece. Despite the fact that the independence of Albania is guaranteed by the League of Nations, Italy has practically converted that country into an Italian province. She has thus bottled up the Adriatic and secured a firm foothold on the Balkan peninsula. Great Britain, with definite commitments under the Locarno Pacts, is greatly interested in maintaining the status quo and peace in

Europe. In Asia and Africa, important British interests conflict with those of the Russian communist leaders; Great Britain's chief concern is to checkmate the international revolutionary program of the Bolsheviks. The League of Nations reflects the alignments indicated above and can do little more than provide an open forum for the discussion of international problems. Vital questions involve national decision and action rather than international arbitration. Such regional compacts as have been registered with the League are primarily security measures which tend to establish a new "balance of power" in Europe. So long as a spirit of mutual distrust and fear governs European nations, there can be no assurance of continued peace.

Russia

Russia dominates the troubled outlook of the powerful European nations. Her unceasing efforts to foster world revolution for proletarian dictatorship, and a standing army of a million men, are a constant menace to the peace of Europe. The Bolsheviks, up to the present, have relied mainly upon well financed propaganda to spread their revolutionary doctrines. Joseph Stalin, now virtually a dictator, has consistantly followed Lenin's policy that "the soundest strategy in war is to postpone operations until the moral disintegration of the enemy renders the delivery of the mortal blow both possible and easy." Control of the Third Internationale, the central governing body of communists of all nations, enables Stalin, without officially compromising the Russian government, to propagate communism throughout the world. Communist disturbances in China, India, and South Africa show the effect of inflammable material that the Third Internationale for ten years has been spreading among the yellow, brown, and black races of Asia and Africa. Recent disorders in the French army and navy, of proven communist origin, indicates that Stalin still considers propaganda the most effective advance guard for proletarian armies. The international effects of Bolshevik policy and action, whether applied to European nations or to their foreign interests, are of vital importance to the peace of Europe. Communism is frankly imperialistic, with the world as the limit.

While propaganda is doing fruitful work abroad, the Bolsheviks are building up political and economic strength at home. They have a definite program, strong organization, and leaders who maintain discipline. Trotsky and his associates, once powerful in the party councils, are now in exile because they threatened to disrupt the party organization. At present the Communist Party includes less than one per cent of Russia's 140,000,000 people, but schools for children and adults are rapidly educating the masses in the teachings of communism. The peasants, who have had possession of their farms for the past twelve years, will not readily accept the communist theory that all land belongs to the state; the workers employed in subsidized national industries are more easily persuaded. To maintain their power, the Bolsheviks must foster industry and convert the new industrial workers to communism before the

agricultural peasants can effectively interfere. Plans calling for capital investments in 1928 of over $600,000,000 for industrial plants and equipment, show the urgency of their economic program. An outstanding feature of the new economic order is the Industrial Planning Commission, which aims to eliminate the waste that accompanies haphazard development. It analyzes national economic problems and allocates industrial projects in accordance with national needs. The Bolsheviks have made strenuous efforts to secure enough capital to finance their gigantic industrial projects and to equip existing plants with up-to-date machinery. Their success may be judged by results; despite seven years of continuous war (1914-1920), Russia is now stronger politically and economically than she was in 1913.

The Russian military situation remains to be considered. Ever since the diplomatic break with Great Britain three years ago, the Bolsheviks have conducted an intensive propaganda campaign at home to convince the people that the Soviet Union must prepare to defend itself against attacks by capitalistic industrial nations. Flat rejection at Geneva of the 1927 Soviet proposals for complete disarmament gave this campaign fresh impetus. The Soviet representative, M. Litvinov, proposed to dissolve all armies, navies, and air forces; to destroy all weapons, military stores, and means of chemical warfare; to scrap all warships, fortresses, naval air bases, and war industry plants; to abolish all general staffs; to discontinue all citizen military training and all appropriations for military expenses. Appropriations for revolutionary propaganda were not mentioned. On April 16 of this year, M. Litvinov renewed these proposals in an address before the League of Nations preparatory disarmament commission. His eloquence left the delegates unmoved, but no doubt served well for home consumption. Anticipation of foreign aggression has resulted in the formation of a national association, with millions of members throughout Russia, for protection against gas and air attacks. In September, 1928, the effectiveness of air and gas defensive measures was tested in a maneuver at Kiev, a Ukrainian city of some 525,000 inhabitants. Business activities were practically suspended during the maneuvers, and the entire civilian population cooperated enthusiastically with the military authorities. In preparation for this exercise, the local newspapers published detailed instructions and dwelt upon the necessity for such thorough organization that in the event of war the city could protect itself unaided. The simple minded Russian apparently takes his "preparedness" seriously.

If convinced of the hostile intentions of foreign nations, the Russian masses will look upon any war as a struggle for existence. Army units, from the regiment up, are subjected to direct supervision by special political agents who spare no pains to instruct recruits in the Bolshevik ideas of communion. As compulsory service brings a new class of about half a million men into the army each year, these political agents have excellent opportunities to exert great influence. Russia's avialable military man power numbers about fifteen million men, many of whom have received military training. The armed forces include

250,000 secret police (O. G. P. U.); 600,000 regulars on active duty; 500,000 well trained men in the regular army reserve; and 800,000 in organizations that correspond to our National Guard units. The junior officers are mostly products of the army school system; their leaders are the ablest survivors of recent national and civil wars which gave them plenty of combat experience.

During the past eight years, airplanes, gas, and tanks have received special attention. Russian-built planes have been widely used to carry communist propaganda into outlying provinces and to demonstrate the power of the present regime. With powerful support from the government, and probably the assistance of German engineers, the Russian aircraft industry has made great progress. Chemical industries have been fostered, and their products applied to military training, especially in connection with tanks. Their machines are said to have gas-proof hulls and oxygen containers for purifying air in the fighting compartments, in addition to gas masks for members of the crew, and many of them are fitted with devices for producing gas or smoke. Why these elaborate precautions? The use of lethal gas and toxic smoke in war has not been outlawed, even by the United States, and, regardless of public opinion on the subject, chemical agents will probably be extensively used in future wars. When we realize that a single machine can carry tons of casualty producing chemicals and can operate in spite of gas attacks by airplanes, this development appears worthy of most serious consideration. Whether the Bolsheviks have developed practical methods of degassing contaminated machines is unknown. They first acquired tanks in 1919 and 1920 by capturing about forty French and British machines that had been turned over to Denekin and Wrangel. The captured machines have been rebuilt to improve mechanical performance, increase fire power, and add speed. New tanks have been purchased abroad, and work is now in progress in Russian factories on machines of Russian design. Light and medium tanks predominate, though some work has been done on an eighty-ton tank with two 76-mm. guns, 1.6-inch armor, and a maximum speed of six miles per hour. For the control of these machines, radio sending and receiving sets have been developed. Armored cars, armored railway trains, and self-propelled cross-country supply vehicles have received considerable attention. Training regulations apparently contemplate the use of all these armored vehicles in cooperation with cavalry divisions, air formations, and independently in large numbers. The tanks now in service in the Red Army are probably twice as effective as those used by the Allies during the World War.

If the Bolsheviks intend to follow up their revolutionary propaganda, Mechanization has arrived at a most opportune time. Their willingness to try new methods is unquestionable; they have used all of Russia for the past twelve years as a testing laboratory for the greatest social experiment the world has ever seen. They must push on or fail, for even in Russia the social order has begun to stabilize without conforming to purely communistic ideas. Increased discontent among the farmers may force the Bolsheviks to seek war abroad as a means of retaining control at home. Their leaders are shrewd enough to realize

that new weapons, if properly developed and used, will give the Red armies superior offensive power. Fighting machines will partially relieve them of dependence upon mass armies of uncertain loyalty and concentrate war power in the hands of trusted party members. Even though vastly in the minority, they could effectively police the country and still carry on offensive operations. Mechanization will help greatly to solve their transportation problems. Railway construction has increased the 1915 mileage by twenty-five per cent, and the rolling stock now in service is about thirty per cent more than in 1923; but the railways are still entirely inadequate for the rapid movement and supply of great armies. Mechanization of expeditionary troops would reduce the number of men and the tonnage of food, clothing, arms, and ammunition that would be required initially for decisive operations. By eliminating many of the items that were considered essential during the World War, the Bolsheviks could probably maintain powerful mechanized forces in theaters formerly beyond their reach. A surprise attack towards the west, swiftly delivered, would overwhelm the disunited forces that might be assembled in opposition. The small states—Poland, Czechoslovakia, Jugo-Slavia, and Roumania—that now form a feeble barrier between Russia and western Europe, are poorly prepared to defend themselves. All are suffering from internal political struggles which have retarded economic development; and all are engaged in more or less serious disputes with their neighbors. The Bolsheviks have never admitted the validity of Roumania's title to Bessarabia and have unceasingly poured communist propaganda into that sadly misgoverned province. Communist uprisings would probably occur if Red forces moved westward through Bessarabia. If we recall the victorious campaigns conducted 500 years ago by the horsemen of Jenghis Khan in their conquest of a large part of Europe, it requires little effort to picture fast cross-country fighting machines in a similar role today. Superior mobility on the battlefield is just as effective now as it was 500 years ago.

Can the Reds produce and maintain a formidable mechanized force? Such forces as are known to exist are too weak for decisive use at present, but they show surprisingly rapid development. Eight years ago Russian industry was a mass of wreckage; now it is able to produce reliable airplanes and fast tanks. A few determined men in control of highly centralized governmental machinery have secured remarkable results along the lines they have chosen to follow and their facilities for the manufacture of war equipment are constantly improving. Industry is already largely nationalized—a tremendous advantage if the leaders desire rapid expansion of their mechanization plans. By concentrating on the production of war equipment, these industries, even in their present state of development, could probably supply the needs of the army. Domestic supplies of basic raw materials, oil, and fuel are available. The Industrial Planning Commission has no doubt provided for the necessary manufacturing plants and equipment; and, judging by results already obtained, has to some extent remedied the deficiency of technically trained operatives. So far as the army itself is concerned, remodeling would be comparatively easy. The army is

young and lacks fixed traditions; consequently there would be little passive resistance to the change. Few vested interests would be disturbed either in the combat forces or in the supply branches. A shortage of suitable officers and men to maintain and operate the machines in the field might restrict their use; but similar difficulties were overcome by the Allies during the World War when the drain on man-power was far more severe than Russia has experienced for some years. The Soviet Union contains many diverse elements and it would be strange indeed if 140 million Russians could not supply the few thousands that would be needed in a mechanized force. Changes wrought by the Revolution, for better or for worse, have given the younger generation a new outlook on life. Whether the men now coming of age accept communism or not, they are far more alert mentally and physically than were the peasants of pre-war days. This fact should be recognized in estimating their potential value for service in mechanized units.

Expense is another item that must be considered. From the peaceful tax-payer's viewpoint, investment of large sums in fighting machines appears extravagant. The machines may be obsolete before there is any occasion to use them. However, the Bolsheviks control the purse strings of the Russian government; they have spent large sums, needed for internal development, on propaganda abroad, and certainly will not hesitate the invest heavily in fighting machines if they see fit. In addition to direct taxes, the government has a large income from its complete monopoly of foreign trade and from concessions that have been leased to foreign corporations. It owns the raw materials, manufacturing plants, and all banking institutions. Funds to pay for the manufacture of fighting machines would have to be taken from other projects, but there is no doubt that ample funds could be made immediately available. In figuring expense, the initial outlay is a small part of the total required for active operations in war. An article by Mr. Herbert W. Alden, in the *S. A. E. Journal* of May, 1919, referring to the use of British tanks at Cambrai in 1917, states, "The saving in ammunition—which would have been used according to the old system in this one engagement—equalled the entire expense of the tank development up to that time." Mr. Alden's valuable work in our Ordnance Department during the war enables him to speak with authority. If other savings, such as man-power and transportation, are added into the account, the balance is strongly in favor of mechanized war equipment. The Bolsheviks could easily justify their expenditures for fighting machines on the grounds of eventual economy.

Under able and determined Bolshevik leadership, Russia can no doubt produce and maintain strong mechanized forces. Reliable information about the Red Army is scant; hence, some of the foregoing discussion is necessarily based on conjecture. Directives have been issued for the formation of independent mechanized units and for a large number of tank regiments; and regulations for their training have been published. To what extent Russian mechanization plans have been executed is uncertain; but one thing is sure—progress

in the organization of mechanized units will whet Bolshevik zeal for world revolution.

Germany

The Treaty of Versailles prohibits the use of tanks in the German army. This fact endows mechanization with exceptional interest for the younger generation, and the World War experiences of the veterans serve to stimulate serious study of the subject. Those most interested in the construction of fighting machines have sought employment in countries where treaty restrictions do not apply. German technical experts have assisted in the production and presumably in the operation of Russian machines. The new Czechoslovakian tank, of the combined wheel and track type, was designed by Herr Vollmer, chief engineer for the construction of German tanks in 1918. It is perhaps significant that the Swedish tank, which can find little employment on Swedish terrain, is remarkably similar to the light tanks that Germany was forced to dismantle in 1919. Dummy tanks propelled by man power are being used for training purposes at home; but abroad German engineers are perfecting their designs and gaining experience in methods of construction. There can be little doubt that certain German factories now have blueprints and tools for making modern tanks that have been thoroughly tested. When circumstances change, Germany will be well prepared to apply her highly developed industries, if need be, to the rapid production of war machines.

In the meantime, antitank defense receives great attention. The proposed defensive measures are naturally based on disastrous World War experiences, but show appreciation of the fact that present day tanks are much faster than those used in 1918. Information on foreign fighting machines has been collected and published. Details of the American T1 E1 model 1927 light tank were published in Germany and Austria when all matters pertaining to this machine were considered confidential in our own service. Specific data on weight, dimensions, speed, crew, armament, armor, vulnerable points, and other characteristics, with photographs and diagrams drawn accurately to scale, are being circulated among those in the military service. Military writers have made exhaustive studies of fighting machines and their tactical uses, and have published several books on the subject. As a result of this laborious research and of encounters with tanks in 1917-18, the Germans have evolved carefully considered methods of antitank defense. *They have changed their combat organization, equipment, and training to meet, as best they can, the new conditions imposed by tanks.*

The combined use of tank obstacles and antitank fire is the basis of their present defensive tactics. Artificial obstacles such as trenches, traps, barricades, palisades of posts or rails, and mine fields are considered; but their value is heavily discounted on the ground that there will seldom be enough time or labor available for the necessary construction. Strong emphasis is placed upon the election of defensive positions which are protected from tank attacks by marshes, water courses, thick woods, precipitous slopes, or large boulders; even

though the resulting position sacrifices important features that would be desirable for defense against troops that have no tanks. Antitank weapons, organized in depth in conjunction with defensive machine guns, form the real basis of the defense.

The weapons to be used are as follows: Infantry rifles with armor-piercing ammunition; minenwerfers; flame throwers; caliber .50 machine guns with armor-piercing ammunition; automatic and semi-automatic infantry cannon of 20-mm., 37-mm., and 57-mm. caliber, with high velocity ammunition and wide traverse; 77-mm. guns, horse drawn; 77-mm. guns, mounted in automobiles. Some of these weapons, particularly the heavy machine guns, are designated as special antitank guns; they are to be camouflaged and remain inactive until hostile tanks appear.

Infantry is trained to fire on enemy troops until hostile machines are within comparatively short range and then concentrate their fire on the eyeslits of the machines. Artillery training includes much practice in direct fire on moving targets. A horse drawn battery of six 77-mm. guns, primarily for antitank defense, is assigned to each infantry regiment. In each infantry division, there is a battery of four 77-mm. guns, mounted on automobiles, whose duty it is, in cooperation with infantry cannon and horse drawn 77's, to destroy with direct fire at short range enemy tanks that penetrate the defensive position. Mobile fire units to supplement the fixed defenses are considered highly essential. Both passive and active antitank measures that can be carried out with available means are to be fully utilized. German military leaders keenly appreciate the combat value of the tank. They have already done everything that they can under present conditions to neutralize its power, and by so doing have prepared all ranks for changes that may come in the future.

The Organization and Employment of British Antiaircraft Artillery

By Lieut. John R. Burnett, C. A. C.

LITTLE or nothing had been done before the World War by any of the leading powers in developing antiaircraft defense. It was only a short time, however, after the entrance into the war that we find all participants actively engaged in developing antiaircraft materiel and training personnel in its use.

The early efforts were, naturally, the attempt to modify existing Field Artillery maeriel for antiaircraft use by giving it greater elevation; and these improvised weapons were manned by Field Artillery personnel. It was soon apparent, however, that the firing of antiaircraft guns against aircraft, whether they be machine guns or guns of greater caliber, was a very different matter than firing against ground targets—they required differently constructed mounts and specially instructed personnel; also, that Field Artillery is needed for ground fire at the same time that antiaircraft fire is most needed—normally during an attack.

Very soon, therefore, we find the organization in the armies of all powers of special troops for antiaircraft defense. The developments proceeded in all countries along very similar lines—machine guns for low, fast-flying planes and guns of varying larger caliber for targets at greater altitudes.

So in December, 1916, we find the British with one Antiaircraft Group in each Army. A "Line of Communication" Antiaircraft Group was also formed, divided into antiaircraft areas under the Group Commander. This organization remained until the end of the war, but antiaircraft batteries, in practice, contained varying numbers of sections according to the needs of the moment.

Now before proceeding further with the discussion of the British Antiaircraft Service we must study its organization, because in point of organization the British, since the war, have moved in a direction so radically different from our own service that it is startling.

In our service we find the problem of antiaircraft ground defense (if we neglect that local defense of other arms against low-flying planes provided for by antiaircraft machine guns, which are part of their equipment and manned by their own personnel) is assigned to the Coast Artillery. And our antiaircraft artillery, within the Coast Artillery, comprises all means of antiaircraft defense, including guns, machine guns, searchlights, and all auxiliaries pertaining thereto.

This is not so in the British service. In that service all artillery, both Field and that which we term "Coast," is grouped under one head and command, the Royal Artillery. And in the British Army only those antiaircraft organizations

manning guns are assigned to the Royal Artillery. The searchlight organizations are part of the Royal Engineers; while the signal communications for the antiaircraft defense are provided for by Antiaircraft Signal companies which are part of the Royal Signal Corps.

You will notice that no mention of machine-gun organizations is made. This is because the British Antiaircraft Service contains no such units. Troops in the field will furnish their own machine-gun protection, the antiaircraft units using machine guns as secondary weapons. In our service, a machine-gun battalion is contained in each antiaircraft regiment. In addition, each unit of the other branches of our service is equipped with antiaircraft machine guns for local defense. As a means of drawing a comparison of the efficiency of the machine-gun defense in the two services, let me mention our experience in the World War. The first American antiaircraft machine-gun unit arrived at the front August 1, 1918, and at the signing of the armistice there were two battalions on the front, operating ninety-six machine guns, and they had in so short a time accumulated forty-one planes to their credit. It has been estimated that there were 1500 other machine guns for antiaircraft purposes assigned to other units of our army. So far as has been officially reported but two planes were shot down by these other guns. The contrast tells its own story.

It might be of interest to note that the standard antiaircraft machine gun of the British is the Lewis machine gun which is fired from the shoulder. Controlled fire for machine guns has not been attempted except for production of two four-gun multiple mounts, mounting .303-caliber Vickers machine guns. These have not been tested yet.

Now to consider the strength of the various antiaircraft units.

An antiaircraft brigade consists of a brigade headquarters and three gun batteries. Each battery is divided into five sections—the first four sections are gun sections manning two guns each. The fifth section mans four Lewis machine guns used for close defense of the battery against low-flying planes, *i. e.*, one machine gun for each section—which is certainly insufficient defense for four two-gun units.

Now, as just stated, the British battery mans eight guns divided into four sections, and each of these sections is a fire unit containing besides two guns and the necessary range and fire-control apparatus. In other words, as organized, this British battery is in reality a battalion of four batteries of two guns each, and furthermore it is employed, tactically, as a battalion would be, and is commanded by a major and not a captain.

In a brigade, two of the batteries man 3-inch 9-cwt. guns mounted on lorries or trucks which transport the gun to the firing position. Arriving there, I beams are placed under the lorry carriage and, by means of screw jacks, are jacked up until they carry the weight of the carriage and guns.

The third battery mans 3-inch 20-cwt. guns mounted on traveling platforms which are drawn by tractors.

Again it might be of interest to note that the British have adopted the Vickers Director for antiaircraft gun fire for use with Case III fire. This director is

almost identical with the Vickers Director tested by our service at Aberdeen, Maryland, last year. With this director is used a 15-foot base height finder of the coincident image type. The British do not look with favor on an antiaircraft gun of greater caliber than the three inch. Also, their present guns are of a low muzzle velocity, around 2000 f. s. In 1927 they tested guns with a muzzle velocity of 2600 f. s. but it was found that the life of the barrels was never more than 1500 rounds. Due to the short life of the gun the war office refuses to approve the new models until some means were devised to increase their life.

Each Searchlight Battalion consists of a Battalion Headquarters and four searchlight companies. Each searchlight company is equipped in peace time with twenty-four searchlights divided into four sections of six lights each. In war time it is equipped with forty-eight lights divided into eight sections of six lights each. We will consider their employment later in this discussion.

The latest type searchlight in the service, and which has been adopted as standard, is a barrel type light, 150 amperes, 75 to 80 volts, 90-cm. (about 36 inch), paraboloid reflector, and delivering 250 million candle power. But this is transported on and the power generated by an obsolete type of truck which is a relic of the last war. This, when carrying the light, its equipment, and a crew of 12 men, is very greatly overloaded. Also, very little progress has been made in the location of planes at night by sound-locating apparatus.

The remaining antiaircraft unit is the antiaircraft signal company. This is composed of seven sections. The first two sections are attached to the antiaircraft brigade headquarters, the next four sections accompany the four searchlight companies of a searchlight battalion. The 7th section is a cable section. An additional cable section is added in time of war.

And now we come to the combination of all the various antiaircraft agencies for defense. The first unit containing all means of antiaircraft defense is the antiaircraft defense brigade. This consists of the following:

1 Air defense brigade of one or more air squadrons, each squadron consisting of 24 combat planes.

2 Antiaircraft brigades, R. A.

1 Antiaircraft searchlight battalion, R. E.

1 Antiaircraft signal company, R. Sig. Corps.

Again we see a radical change from our own antiaircraft defense. Here we have the air service and the antiaircraft service, not separate and cooperating with each other, but rather joined together and working under a single commander—the Antiaircraft Defense Brigade Commander.

And the antiaircraft defense brigade is always employed as a unit in the defense. For home defense it is assigned an area to defend. In the field all defense brigades are assigned to G. H. Q. and by G. H. Q. are assigned to armies or to rear area defense. Never is a brigade broken up into smaller units and attached to Divisions or Corps, thus insuring unity of control and defense throughout large areas.

The general proportion of antiaircraft units in the field to the force in the field will be one normal antiaircraft brigade to two infantry divisions. Here we might draw a comparison between the amount of antiaircraft defense provided at the front in our service and the British service:

Taking the British service first, let us work on the basis of twelve divisions on the front. With the ratio of one antiaircraft defense brigade to two divisions, this will give us six antiaircraft defense brigades. Neglecting the air force and the signal troops, we find that six antiaircraft defense brigades comprise twelve antiaircraft brigades manning twenty-four guns each. This gives us a total of 288 guns. Also, six antiaircraft defense brigades will contain six antiaircraft searchlight battalions, or twenty-four searchlight batteries, manning forty-eight searchlights each, giving us a total of 1152 searchlights.

Now to consider our own service. Let us take twelve divisions again which would normally be divided into four corps. Each corps has one antiaircraft regiment as part of the corps artillery. An army, normally of three corps, has three antiaircraft regiments as Army artillery or one regiment per corps. So for our four corps we can expect four antiaircraft regiments in the Army Artillery. Now the antiaircraft artillery assigned to G. H. Q. is an uncertain quantity. But in the hand book, *Tactics and Technique of Artillery,* we find the statement that for six field armies or eighteen corps, G. H. Q. will have eighteen antiaircraft regiments or the ratio of one antiaircraft regiment to a corps. If we take this as a basis we have then four antiaircraft regiments in G. H. Q. artillery for four corps at the front. Totaling all these we find that for four corps at the front we will have twelve antiaircraft regiments, and these twelve regiments man 144 guns and 144 searchlights.

Comparing these figures we find that for the same number of divisions on the front the British will have twice as many antiaircraft guns as our troops would have (organized into four times as many firing units) and eight times as many searchlights.

This superior fire power can be reduced quite a lot in the consideration of low-flying planes when we recall that our antiaircraft regiments contain machine-gun battalions, which, armed with .50-caliber machine guns, will have an enormous fire power even up to medium altitudes, not to mention 37-mm. antiaircraft guns that are being tested and will undoubtedly be in use soon.

But the difference in the number of searchlights in the two services is startling. The reason for this might be partly understood by considering the employment of the British searchlights. The British do not assign platoons or sections of a searchlight battery to a gun section or battery. Instead, they locate searchlights over an entire area in such a manner as to cover all approaches and insure the illumination of the target during the entire time it is over the area. Furthermore, the British have gone deeply into the question of night defense by aircraft aided by searchlights, and a goodly number of the searchlights in the searchlight battalion will be assigned to the air brigade for use with planes for night air defense. The effectiveness of such night defense is well shown by the fact that a special British organization of fifty-six searchlights and

twenty-six pursuit ships, between Cambrai and St. Quentin, destroyed twenty German night bombardment planes during the summer of 1918.

And, lastly, we might mention the peacetime antiaircraft establishment. At the present time the following antiaircraft units are maintained (excluding the air service).

Two antiaircraft brigades, one of which has just recently been organized and equipped.

One antiaircraft searchlight battalion, R. E.

One antiaircraft Signal company.

In addition, a school of antiaircraft defense is maintained at Biggins Hill, Westerham, Kent. The school consists of the artillery wing (antiaircraft artillery school) and the Engineer wing (antiaircraft searchlight and sound locator school).

Besides these regular army establishments there are also three territorial antiaircraft brigades. The territorial brigades are equipped and organized similarly to those of the regular army. In time of war the regular army units would be dispatched to the front and the defense of the British Isles would devolve upon the territorial units.

The antiaircraft brigades both regular and territorial hold target practice each year at Watchet Hill on the south side of Bristol Channel.

The remaining units of the antiaircraft defense, including the air forces, searchlight units, and signal units, as a culmination of the annual training year, engage in a series of exercises known as the annual air force maneuvers. These are maneuvers extending over several days in which the defensive combat units of the air force, aided by the searchlights at night, try to defend a certain area of England, usually that near London, from simulated attack by bombing planes. And in closing we might draw the following conclusions with respect to our antiaircraft service and that of Great Britain.

(1) In general, in technical development we are probably far ahead of Great Britain, (32) in tactical principles we are on a parity, (3) in the conception and execution of a combined defense they are probably ahead of us due to the experience gained in the annual combined maneuvers.

The Atlanta Campaign

By Captain E. W. Hill, A. C., and Captain L. D. Farnsworth, C. A. C.

THE opening of the year 1864 found the Union controlling the Mississippi River over its entire length, thus severing the great southwest cattle country from the Confederacy. The Arkansas River was under control of the Union and an expedition was operating on the Red River to tighten the grip on this southwest country. The Atlantic and Gulf ports of the Confederacy, if not actually in the hands of Union troops, were blockaded by Union vessels to prevent Southern cotton reaching Europe and European war supplies reaching the Confederacy. The northern limit of Confederate control was practically along the southern boundary of Tennessee, the southeast boundary of West Virginia and the Rapidan River through old Virginia.[1]

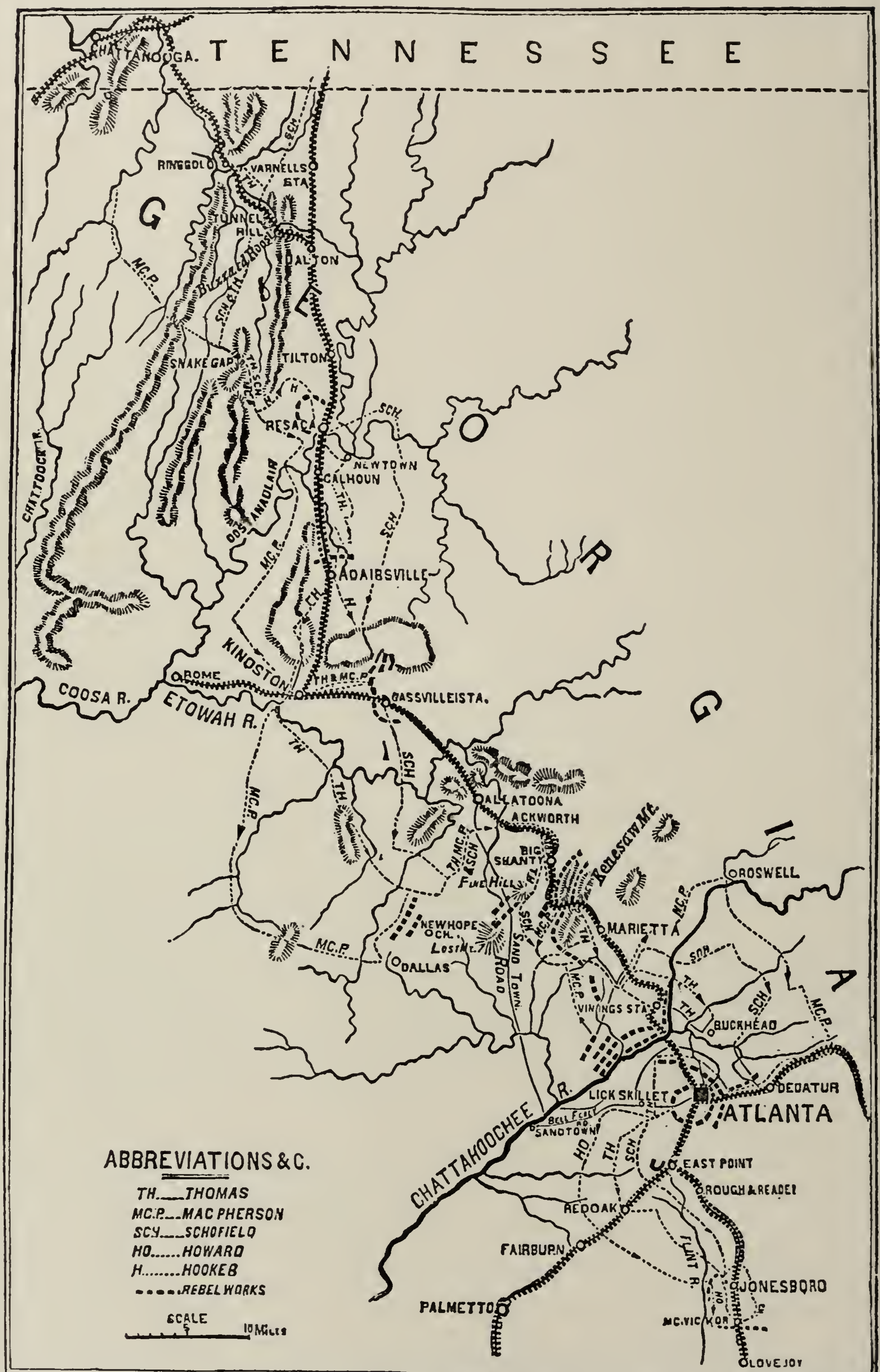
Guarding this northern line, the Confederates had two major groupings of forces; one under Joseph E. Johnston at Dalton, Georgia, south of Chattanooga, covering Atlanta, and one under Lee on the Rapidan River, covering Richmond.

In March, 1864, General Grant was made a lieutenant general and placed in command of all the Union armies. His general plan of operations for 1864 was for concerted offensives on all fronts from the Mississippi to the Atlantic and by continued pressure, to defeat the Confederate armies and drive them back on their bases, at the same time constantly narrowing down the territory supplying those bases.[2]

His plans called for two major thrusts into the Confederacy. The Army of the Potomac, under Meade but closely watched by Grant himself, was to drive Lee's army on Richmond, while Sherman, with the armies of Cumberland, Tennessee, and Ohio, was to drive Johnston on Atlanta, cutting deep into the Confederate zone of the interior. Two minor thrusts were planned, one to be by Butler along the south bank of the James River, on Petersburg and by the rear on Richmond, and one by Siegel up the Valley of Virginia on Lynchburg. All offensives were planned to start concurrently as soon as roads opened up in the spring of 1864.

In conformity to Grant's plans, Sherman, during April, 1864, concentrated and prepared his armies in the vicinity of Chattanooga. The Army of the Cumberland, under Major General Thomas, consisting of three infantry corps, a total of nine divisions, and one cavalry corps of three divisions, in all a total of 60,700 men, were concentrated near Ringgold. The Army of Tennessee, under Major General McPherson, consisting of three infantry corps, totaling seven divisions, in all, 24,400 men, were concentrated at Gordon's Mill.[3] The Army of Ohio, under command of Major General Schofield, consisting of one infantry corps of two divisions and one cavalry division, in all 13,900 men, were con-

[1]Battles and Leaders, IV, 101.
[2]BL, IV, 97, 247.
[3]72 Rebellion Records, 62.


TENNESSEE
GEORGIA
CHATTANOOGA.
RINGGOLD
VARNELLS STA.
TUNNEL HILL
DALTON
SNAKE GAP
TILTON
RESACA
NEWTOWN
CALHOUN
ADAIRSVILLE
KINGSTON
ROME
COOSA R.
ETOWAH R.
CASSVILLE STA.
ALLATOONA
ACKWORTH
BIG SHANTY
Kenesaw Mt.
ROSWELL
MARIETTA
NEW HOPE CH.
DALLAS
VININGS STA.
BUCKHEAD
LICK SKILLET
DECATUR
ATLANTA
SANDTOWN
EAST POINT
ROUGH & READY
RED OAK
FAIRBURN
JONESBORO
PALMETTO
LOVEJOY
CHATTAHOOCHEE R.
FLINT R.
SAND TOWN ROAD
ABBREVIATIONS &C.
TH.—THOMAS
MC.P.—MAC PHERSON
SCH.—SCHOFIELD
HO.......HOWARD
H.........HOOKER
- - - - REBEL WORKS
SCALE
10 Miles

centrated at Red Clay—Sherman's combined forces, starting on the campaign to Atlanta, totalled 98,700 men and 254 pieces of artillery. Sherman said that a force of 100,000 men was approximated but never reached.[4] An abstract from his returns, show effective strength varying from 110,000 on April 30 to 81,700 on August 31.[5] The force left in the vicinity of Chattanooga to guard bases no doubt accounts for the discrepency in numbers.

On May 1 Johnston had concentrated his forces in the vicinity of Dalton. His strength return of April 30 shows 63,777 aggregate present, of which 54,500 were carried on the return as present for duty. Between May 10 and May 20 he was reinforced by Polk's Army of Mississippi, which carried on its return of June 10, the item, effective total present, of 19,245.[6] Johnston's effective arm-bearing force after the arrival of Polk, must have totaled at least 73,000 men. Johnston claimed he had only 44,900 men on May 1,[7] Hood, his successor said that Johnston had on May 13 and 20, 70,000 effective arm-bearing men in excellent condition.[8] Johnston's force was organized in three corps of about equal strength, under command of Generals Hardee, Hood, and Polk. His cavalry numbered about 10,900 effective. His attitude at Dalton was defensive. His force, less that of Polk, under command of General Bragg, had been defeated in the fall of 1863 at Chattanooga.

Sherman started operations in the direction of his objectives, Johnston's Army and Atlanta, on May 4.[9] From May 7 to 10 he demonstrated in front of Dalton with the Armies of Thomas and Schofield, while McPherson marched through the mountains on Resaca, 15 miles south of Dalton, and on Johnston's communications. McPherson found Resaca fortified and defended. He attacked, but, failing in his first attempt to reach the railroad, he retired to a defensive position across Snake Creek Gap. Sherman now moved the armies of Thomas and Schofield from in front of Dalton, and concentrated them in front of Resaca, west of Snake Creek Gap, by May 12. Johnston, executing a flank march, withdrew his forces from Dalton and had them concentrated at Resaca by May 13. Johnston left Dalton later than Sherman and marched parallel to him, but was protected in the flank march by a parallel range of mountains. The difficulty of passing his forces through the one gap in these mountains prevented Sherman from deploying in front of Resaca before May 14. Johnston took up a position facing west, his line running parallel to the railroad and his communications. His left rested on the Ooastanaula River. It appears that an opportunity was presented here to drive Johnston to the east and off his communications. No general attack was made. Pressure was placed against the line on the fourteenth and continued on the fifteenth, while a division of infantry and a division of cavalry was sent across the Ooastanaula southwest of Johnston's left flank, threatening his communications. Johnston retired across the Ooastanaula on the night of the fifteenth and burned the bridge.

[4] 72 RR 62.
[5] 72 RR 117.
[6] 74 RR 677.
[7] 74 RR 614.
[8] 74 RR 636.
[9] 72 RR 61; 74 RR 612; IV BL 293; 74 RR 16.

Johnston retired, during the next three days, across the open, rolling country between the Ooastanaula and Etowah River. Sherman crossed the Ooastanaula and pursued on a broad front, at the same time dispatching a cavalry and infantry force to capture Rome, an important manufacturing and storage center at the terminus of a branch railroad extending twenty miles west of the main line to Atlanta.

At Cassville, Johnston converged his columns and took up a position, disposing Polk's and Hood's corps to attack Schofield's column which was widely separated from Thomas and McPherson.[10] Hood was well disposed to catch Schofield in the flank as he deployed to meet Polk. Hood, on receiving information that his right flank was being engaged, changed his front, thus causing delay and allowing time for Thomas and McPherson to close in on Schofield. Johnston, seeing the opportunity lost, retired his forces to a strong defensive position southeast of Cassville, covering the railroad crossing of the Etowah. On being pressed in this position by the three armies of Sherman, Johnston retired on the night of May 19 to the south side of the Etowah, destroyed the bridges, and took up an exceptionally strong position astride the Allatoona pass.

Sherman, familiar with the terrain in the vicinity of Allatoona Pass, knew that it would be difficult to attack Johnston there, so he decided to turn Johnston out of his position by a movement en masse on his rear.[11] A maneuver of this nature required Sherman to leave the railroad and to depend on wagon transport for supply. He accordingly took three days to rest his troops, reconnoiter, build pontoon bridges, and prepare for the movement. He loaded his wagons with rations for twenty days and on May 23 crossed the Etowah, west of Johnston's position, at six places, his columns, converging on Dallas, a town fifteen miles southwest of Johnston's position.[12] The terrain traversed was cut up by many hills and sharp ravines and was covered with a thick growth of timber and brush, with no clearings. Roads were few and of a most primative kind. Under the traffic of so many troops and transport and the drenching of continuous rains, the roads became quagmires. The many columns interfering with one another resulted in much confusion. On May 26, in this wilderness, another obstruction was met in the form of Confederate breastworks, erected near New Hope Church. These breastworks were assaulted unsuccessfully and the advance of the army southward was halted. Johnston had shifted his forces from Allatoona Pass to a line through Dallas—New Hope Church and to the northeast. Due to the dense underbrush, the Union skirmishers could not locate the Confederate position, so Sherman shifted his armies to the left, endeavoring to find the Confederate right. Another attack on May 27, at a point five miles farther northeast was also stopped by Confederate breastworks. Sherman now tried to pass his right flank around to his left but his right was so hard pressed that it was deemed inadvisable to execute this maneuver.[13] By constructing breastworks and moving his forces sideways behind them, Sherman finally got his left flank back on the railroad on June 6. Johnston, to avoid an attack on

[10] 74 RR 612, 628.
[11] 72 RR 61.
[12] IV BL 293.
[13] 72 RR 61; IV BL 293.

his exposed right flank, retired to a line: Lost Mountain—Pine Mountain—Brush Mountain and was once more astride the railroad and facing Sherman's armies.

Sherman now repaired the railroad bridge over the Etowah, moved his advanced base up to Allatoona, constructed blockhouses to protect the Allatoona Pass, and once more moved in the direction of Johnston and Atlanta.

For fifteen days, Sherman exerted frontal and flank pressure on Johnston's army, causing it gradually to shorten and withdraw its lines to a strong defensive line on Kenesaw Mountain. Here, Sherman had the choice of two plans; namely, to assault a strong defensive position or to make a turning movement by the right. To use the words of Sherman—"Either course had its difficulties and dangers and I perceived that the enemy and our own officers had settled down into a conviction that I would not assault fortified lines. All looked to me to outflank. An army to be efficient must not settle down to a single mode of offense . . . I wanted therefore, for the moral effect, to make a successful assault against the enemy behind his breastworks."[14] Accordingly, an order was issued on June 24 for a general assault on the Kenesaw lines on the twenty-seventh. The assault was made with persistency and vigor but was repulsed with a loss of 3000 men of Sherman's army to a loss of 500 of Johnston's army. Sherman quickly started to outflank the Kenesaw position, for, as he said—"It would not do to rest long under the influence of a mistake or failure . . ."[15] He set Schofield to operating on Johnston's left, constructing trenches and edging southward, at the same time replacing McPherson's force by cavalry on the line in front of Kenesaw, and sending him to the rear of Schofield and south to the Chattahoochee River, threatening Johnston's crossings and communications with Atlanta.

Johnston reacted to this maneuver by retiring from Kenesaw on July 3 to a prepared position at Symrna. Closely followed by Thomas, and his bridges over the Chattahoochee still threatened, he retired July 4 to a position covering the bridges. This position had previously been prepared and was strong enough to forbid attack.[16]

Sherman's armies now were disposed with Thomas immediately in front of Johnston's fortified position; McPherson to the south feigning a crossing of the Chattahoochee, and Schofield to the right and rear of Thomas, in reserve.[17] Instead of crossing to the south of Johnston's position, Sherman moved Schofield rapidly to make a crossing ten miles to the north and moved McPherson from right to left in rear of Thomas and Schofield to make a crossing ten miles north of Schofield. These crossings were a complete surprise to the Confederates for they were lightly opposed. Pontoon bridges were necessary for all crossings.[18]

Johnston, learning of the lodgements made east of the Chattahoochee, retired to the Atlanta side of the river on July 10 and burned the bridges in vicinity of Atlanta. Thomas now moved to the north a few miles and crossed

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[14] 72 RR 68.
[15] 72 RR 61.
[16] 72 RR 61, 127; 74 RR 612.
[17] 72 RR 127; 74 RR 612.
[18] 73 RR 515.

the Chattahoochee with little difficulty, being protected from Johnston's army by the confluence of Peach Tree Creek at the Chattahoochee.[19]

Sherman's three armies now wheeled to the right and southward on a 25-mile front, closing in on Johnston and Atlanta.

On July 17, Johnston was relieved by a telegram from Richmond which placed Hood in command succeeding him.[20] Johnston's relief was due to dissatisfaction which had arisen because of his failure to prevent further invasion by Sherman.

By the evening of July 19, Sherman's armies were disposed as follows: Thomas's Army had wheeled right and was crossing Peach Tree Creek; Schofield's Army had marched to the southeast and was about to cross this creek east of Buck Head Road; McPherson's Army was approaching Decatur.[21] These positions gave the army, as a whole, a huge front, leaving a large interval between Thomas's left and Schofield's right. Thomas attempted to close this interval by placing two divisions under Howard therein to connect with Schofield. This, however, left sufficient interval for Hood to attack Thomas's left as soon as he should cross the creek.[22]

Using Cheatam's corps and some Georgia militia under Smith, with cavalry on the extreme right to hold Schofield and McPherson, Hood attacked Thomas's left flank on the afternoon of the twentieth. This attack was repulsed by Thomas.

Continuing the wheel on the twenty-first the Union Armies closed in about Atlanta. Hood withdrew to prepared intrenchments close around Atlanta. On the twenty-second, Thomas and Schofield, apparently misled into beliving Hood had evacuated Atlanta, pushed forward toward Atlanta and McPherson started pursuit to the south and east of Atlanta.[23]

Hood, however, attacked the Union left flank, using Hardee's corps and Wheeler's cavalry. Taking McPherson by surprise, Hardee rolled up McPherson's flank and captured Decatur. He was, however, repulsed.[24] In this engagement, the Battle of Atlanta, McPherson was killed and Howard succeeded to command of his army.

Since the Macon Railway was Hood's main line of supply, Sherman's next objective was that railway. On the morning of July 27, Howard marched his army to the right in rear of Schofield and Thomas, with the object of striking that railway below Atlanta. In opposition to this movement Hood sent Stephen D. Lee to cover the roads on the west of the railways. Coming unexpectedly on Howard at Ezra Church, he attacked and was repulsed.

The Cavalry had been ordered to strike the railway at Jonesboro from both sides. As Cavalry operations will be dealt with later in detail, it will suffice here to say that the cavalry did not carry out its mission.

While awaiting the results of the cavalry operations, Sherman was strongly entrenched but his line was drawn out for a distance of ten miles.

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[19] 74 RR 612; 72 RR 127.
[20] 72 RR 53.
[21] 72 RR 71.
[22] 72 RR 306.
[23] 72 RR 72.
[24] 72 RR 73.

Before August 4, Sherman had received reports as to the failure of his cavalry in cutting the lines of supply.

Sherman decided to attempt to cut the railroad with the bulk of his main force, and orders were issued to carry this project into effect. This move necessitated the raising of the siege of Atlanta. The movement began on August 25, withdrawing units from the extreme left of the line to start. Continuing the move upon the Montgomery Railway, Sherman destroyed in detail twelve and one half miles of the railway.

Having made a personal inspection and being satisfied with the destruction, Sherman ordered the whole army to move eastward over several roads, with Howard, Thomas, and Schofield, approximately in line from right to left, the right moving on Jonesboro.[25]

This movement was in the nature of a left wheel about Schofield. On the thirtieth, Schofield advanced toward Eastpoint covering the trains, while Howard and Thomas continued the wheel, meeting some cavalry opposition which was rapidly overcome. On the morning of the thirty-first, having met the enemy in force, Sherman deployed one corps, with a corps on each flank. Here Thomas took up a position in readiness.[26]

Having received information as to the dispositions of Howard, Sherman ordered a general advance on the Macon Railroad. During this advance the enemy about Jonesboro came out of his trenches and attacked Howard, who, being on favorable terrain, repulsed the attack with heavy enemy losses. Late on the same day Schofield, Thomas, and Howard all hit the railroad, and with cavalry to the rear and north covering the lines of communication, Sherman ordered the armies to close in on Jonesboro, destroying the railroad as they advanced. Cavalry was sent south of Jonesboro to protect the right and sieze the railroad there.

Sherman's desire was to attack and cut off the enemy lines of retreat but, due to the distance the northern elements had to travel and to the nature of the terrain over which they had to advance, they were unable to arrive on the same day. However, one corps under Davis, arriving in ample time, launched an attack with splendid success. Darkness prevented a coordinated attack and by morning the enemy had moved out to the south, evacuating Atlanta and positions near Jonesboro, and destroying their deserted trains and munitions. Having lost contact with the enemy Sherman took up a position in readiness awaiting information as to enemy dispositions.

Sherman received confirmation from Atlanta of the retreat and the taking up of a new defensive position at Lovejoy station by the enemy, and due to the difficult terrain he considered pursuit futile and withdrew to positions from Decatur to Eastpoint, with cavalry on the flanks and rear.

Due to the necessity of covering the Union prison at Andersonville, the Confederates were prevented from an immediate move and the Atlanta campaign was at an end.

[25] 72 RR 650.
[26] 72 RR 61.

The Cavalry in the Atlanta Campaign

By Captain E. A. Varona, C. A. C.

AT the start of the Atlanta Campaign when General Joseph E. Johnston assumed command at Dalton of the Confederate forces, relieving General Braxton Bragg, his Cavalry was organized as a Corps which at the start numbered less than 2000 horsemen, commanded by General Joseph Wheeler.

The Federal Cavalry was, before the campaign opened, organized into four divisions which were assigned to duty by the Federal Commander-in-Chief, W. T. Sherman, as circumstances required, although nominally attached to the three subordinate armies, the Army of the Ohio, the Army of the Cumberland, and the Army of the Tennessee.

One division was usually on each flank and one covering the line of communications, while the fourth was ready for operations to the front, raids, and similar operations. The nearest subordinate Army Commander usually exercised authority over the cavalry cooperating with him.

The Confederate Army having taken a very strong position at Dalton, Sherman resolved to turn it, McPherson with the Army of Tennessee, preceded by Kilpatrick's Cavalry Division making the main blow or turning movement by the way of Villanow and Snake Creek Gap. Thomas with the Army of the Cumberland supported him by making a strong demonstration against Tunnel Hill and Rocky Face Ridge in front of the Confederate position. On the ninth, Schofield, with the Army of the Ohio, moved down from the north. E. M. McCook's cavalry division covered his left and was repulsed in a sharp dismounted skirmish with the Confederate cavalry under Joseph Wheeler at Varnell's Station.

A Confederate cavalry brigade was about to occupy Snake Creek Gap, where it was defeated by the Federals under McPherson.

When General Sherman moved his whole Army to Snake Creek, Stoneman's cavalry division was left to cover his line of communications.

The movement of the Federals and concentration was known to General Johnston by the skilful reconnaissance made by Wheeler, who moved his cavalry around the north end of the Federal position and, driving back the Federal cavalry, located the flank.

When General Johnston, on the morning of May 13, withdrew to Resaca, he was followed by Stoneman's cavalry. There he intrenched his position. Kilpatrick's cavalry division and an infantry division crossed Oostanaula by pontoon bridge at Lag's Ferry, five miles southwest of Resaca, the cavalry advancing upon Calhoun.

At the same time Garrard's cavalry division marched from Villanow by the way of Rome to break up the railway between Calhoun and Kingston in the rear

of the Confederate forces. The cavalry, by its mobility, threatening the Confederate rear and lines of communications, played an active part in forcing Johnston to withdraw from Resaca.

At Adairsville on May 17, General Johnston's army was reinforced by 3700 cavalry under W. H. Jackson.

In the pursuit of Johnston's army, the cavalry supported Davis's division in the operation against Rome. The cavalry marched on both flanks of the advancing Federal Army trying to reach the rear of the Confederates.

On the retreat from Adairsville to Cassville the role of the cavalry on both sides was reconnaissance mainly.

During the turning movement of Sherman on May 23 of Johnston's intrenched position in Allatoona Pass, the cavalry covered the left, right and center, and rear of the Federal advancing forces, screening the turning movement. Johnston, finding his position about to be turned, withdrew under cover of his cavalry to New Hope Church; but Sherman's army was able to drive back the Confederate cavalry and to locate the Confederate position.

During these operations the Union cavalry captured Allatoona.

In his new position from Lost Mountain, Johnston had Wheeler's cavalry guarding his left and Jackson's his right.

In Sherman's operation against the Confederate position between June 28 and July 3, the Federal cavalry under Stoneman reached the Chattahoochee near Sandtown.

In Johnston's retreat to Smyrna on July 7, Garrard's cavalry seized Roswell.

About this time a Union cavalry force under General Rousseau was organized at Decatur, Alabama, for a raid. This force destroyed about twenty-five miles of the Montgomery and Atlanta Railway, one of Johnston's main lines of supply. Marching on Marietta they arrived there on July 22.

In the battle of Peachtree Creek, the first battle in which General Hood commanded the Confederate army, Wheeler's cavalry was on the extreme right of Cheatham's corps with the mission of holding off Schofield and McPherson on July 20.

On the twenty-first, Garrard's cavalry (Federal) was sent to destroy the railway from Decatur toward Atlanta.

When, on July 21, Hood withdrew from his position behind Peachtree Creek into intrenchments already prepared close around Atlanta, the Federal Army was in pursuit, but Hood counterattacked, assaulting the left of the Union line with Hardee's corps supported by Wheeler's corps, which gained a position on McPherson's flank and rear. This engagement is known as the Battle of Atlanta.

By July 25, the Federal Army occupied an intrenched line stretching from a point south of the Georgia Railroad and east of Atlanta to a point beyond Atlanta to the northwest. Hood's main line of supply was the Macon Railway. Sherman's next objective was to be the railway. His plan was to send all the cavalry around by the right and left to make a lodgment on it about Jonesboro; the cavalry was assembled in two strong divisions: that of McCook, including

Rousseau's brigade, to the right rear, at Turner's Ferry; that of Stoneman to the left rear, near Decatur.

Stoneman attacked Macon on July 30, was repulsed, and later was captured, instead of obeying orders in cooperating with the other cavalry column in making a lodgment on the railway near Jonesboro.

McCook was defeated on the thirtieth by a part of Wheeler's cavalry, losing 500 men and his artillery. He withdrew to the rear of the army and Kilpatrick's cavalry division took his place on the right of the army.

General Sherman was convinced by the failure of his cavalry raids that the cavalry alone could not make a sufficient lodgment on the railroad below Atlanta, proving that cavalry raids cannot effectually destroy the communications of an army in its own country; but taking advantage of the absence of Wheeler's cavalry, which had been raiding the Union communications as far as Dalton and causing considerable damage, he sent Kilpatrick's cavalry against the railway at Jonesboro, in the hope that the operation would force Hood to evacuate Atlanta. The raid did not accomplish very much; Kilpatrick got off on the night of August 18 and returned on the twenty-second, having made the complete circuit of Atlanta, but failed in his mission.

In the final operations on August 30, the Confederate cavalry screened Hardee, who, with about half of Hood's army, was dispatched by Hood to attack the Federal army, being repulsed.

During Hood's retreat from Atlanta on September 1, to Lovejoy's Station, the cavalry covered the withdrawal.

More than any other country in the world, America is the melting pot of mankind, and it should be fully realized that we must actually assimilate all divergent elements if we hope to fulfill the glorious promise of our past. In this work, it is particularly important that we improve the national physique, teach the national tongue, and aim at unified national ideals.—Gen. John J. Pershing.

Panics

By Colonel George Ruhlen, U. S. A., Ret.

Extracts from the *Militär-Wochenblatt*

LIEUTENANT General von Altrock, the editorial director of the *Militär-Wochenblatt*, contributes to the September 18, 1928, issue of that journal an article on panics in which he says that panics have, from time immemorial, been a frightful episode that appeared unexpectedly, and in most cases inexplicably, to influence events. Just as, according to ancient saga, the herds were brought to a senseless frenzy by the god Pan of flocks, masses of men frequently fall into panics in peace and in war. As long as nerves exist there will be panics. It is therefore incumbent on the soldier to take note of and concern himself with the nature and substance of panics and with measures for their mastery. While improvised and inadequately trained troops are naturally more subject to panics, the history of wars shows that the best troops occasionally give way to destructive and stupefying incidents of war that give rise to panics, especially at the beginning of campaigns, but cease entirely or at least occur very rarely, and then only under most extraordinary circumstances, after troops have become inured to war conditions in active campaign. Panic plays an important rôle in war history of all ages. The combination of incidents that led to a panic were usually imaginary or at least immeasureably exaggerated.

The editor of the *Militär-Wochcnblatt* also takes occasion to invite the readers of the journal to contribute to it brief descriptions of incidents involving panics that have come within their personal experience and observation and of their origin, causes, and consequences and of the measures that were taken to overcome them. General von Altrock is of the opinion that the ten years' interval since the close of the war justifies the assumption that incidents about which one has been silent can now be talked about. He also holds that it is now a question of familiarizing the younger generation of military men who are as yet without war experience with the nature and substance of panics, the circumstances that gave rise to them, and the means taken to suppress them. Measures for quelling panics will in future, as has occurred in the past, be an important function of every officer.

Issues of the journal that have appeared since this invitation was issued indicate that its readers have responded to the invitation and their contributions are not only interesting but instructive. Selection has been made of some of the more important of these communications, a synopsis of which is here given in translation beginning with those contributions of General von Altrock himself in the issue of the journal containing his invitation.

An Historic Incident from the Battle of Jena. In the evening of October 14, 1806, the Prussian troops under Prince Hohenlohe, who had stood up during the day in solid mass against the French and had been disastrously defeated by the French artillery and then dispersed by the cavalry, were in senseless flight from Jena toward Weimar. Gneisenau, who was then a young subordinate officer attached to Blücher's staff, endeavored in vain to stem the wild rush but was carried along with it. But the lesson he learned on that occasion of the nature and course of panics came to him in good stead some years later when, after the defeat of Napoleon's army at Belle Alliance in June, 1815, he, as chief of staff of Blücher's army, was charged with the pursuit of the fleeing French forces. He repeated the tactics that had been employed by the French at Jena and sent his cavalry not only after the defeated enemy but also along their flanks where he placed mounted buglers and drummers and had them follow the French during the night without cessation and succeeded in disintegrating and dispersing them to such an extent that the army as such was broken up and very few succeeded in reaching Paris.

In the Campaign of 1812 of Napoleon's army invading Russia there were many examples of panics. The staff of the French Marshal Davoust, composed largely of German officers, while passing through Poland was quartered for the night in a manor house belonging to a local land magnate. These buildings were usually surrounded by a strongly built stockade of vertically set wooden stakes with an opening through a gate on one side only. The house was opposite this entrance, with a large veranda in its front at the level of the ground. The Marshal and his staff were assembled on the veranda when suddenly there rode through the gate a Russian force of about 100 Cossacks with loud yells. The officers rushed precipitately to the upper floor of the house but the Marshal remained standing on the veranda and addressing a sentinel armed with a musket who was standing by in helpless fright said to him: "*Tirez donc.*" The sentinel discharged his musket and no sooner was the shot heard than the Cossacks, with renewed yells and firing of guns, rushed out through the gate as precipitately as they had come in. When the officers began to apologize for their headless deportment the Marshal replied quietly: "In youth something like this is very liable to occur. I have found, however, that there is no situation that cannot be improved by a quick decision."

The panic of a Prussian Line Cavalry Regiment in the Campaign of 1866 is well known. While the regiment was in march in column on a road to the front it was believed that shots were heard in the immediate vicinity coming from the flank. The regiment turned about and began marching to the rear. The movement increased from a walk to the trot. The officers riding along the flanks increased their pace to a gallop in order to reach the heads of their units. This gallop was at once taken up by the troops and soon resulted in a wild and senseless flight which the officers were unable to control until several miles had been passed over. In their precipitate rush to the rear the regiment encountered a battery that had been following them on the road, and ran through it causing

much damage. Later on it was found that the imaginary sound of firing that had caused the panic was due to the sound of withes and straps with which an adjacent cavalry regiment was dusting its saddle blankets.

The panic-saturated tone of the community, including some of the military contingents, that prevailed at the beginning of the war is well known. Phantom "gold autos," on which it was said the French were sending gold to Russia, were being officially and privately pursued and in numerous cases ostensibly seen and fired upon. In Alsatia the passengers of many military autos that were endeavoring to proceed to their destinations on important service were fired upon and shot; similar fates overtook military officers and civil government officials in the Eastern sections of Germany. Arrests of officers on official journeys were frequent. It came to such a pass that no passenger on a motor vehicle was safe. At Strassburg telephone company employees working on the roofs of buildings were apprehended as French spies. Inasmuch as many of the new troops were being supplied with cartridges there was much reckless firing on the streets.

As an example of the excitement that prevailed in Alsatia the following is characteristic:

The fortified city of Strassburg was, even before war was declared, almost wholly denuded of troops before any war activities took place. As commander of the Sixth Infantry Brigade stationed in Strassburg I was summoned hastily, late in the evening of August 1, 1914, to general headquarters and found the staff of general headquarters and of the local government assembled in full force. They presented to me two despatches. One from the commander of the frontier guard in Breusch valley sector read: "Strong enemy forces of all arms are approaching from Schirmeck through Lutzenhausen toward Molsheim! (Signed) P., Sector Commander." Another was from Schirmeck from Captain I, Infantry Regiment 143 (the most advanced guard company in Breuschestal), which read: "Have just set fire, according to orders, to the wood encampment buildings at Schirmeck." (Instructions had been given that this place should not be allowed to fall into the enemy's hands.) If the first despatch was correct Strassburg was menaced; there was there then only one battalion of infantry and two companies as garrison of the fortress. The first despatch appeared to me to be erroneous because Captain I, of infantry regiment 143, could hardly set fire quietly to the camp at Schirmeck if the enemy advance reported in that despatch was actually in progress. But it was signed by the superior commander at Breuschtal and the section of fortress K. W. II of the city was exposed to the enemy. I was accordingly directed by the commanding general to proceed by rail with a part of my command with the last force remaining in Strassburg, from Strassburg to Lutzelhausen. The battalion embarked at about 10:00 P. M., with the locomotives and tender armed with riflemen and a bugler. On arriving at Molsheim the station superintendent wanted to stop the train from going further because "all railway defiles for at least 20 kilometers were undermined." The officer in command inquired of the station at Heiligenberg:

"What kind of mines were those and who had placed them?" Reply: "Our engineers, because the French are approaching." At the same time the fortress section K. W. II wired: "All available troops are to proceed at once to fortress K. W. II. The fortress is being pressed hard by the enemy and is unable to hold out. (Signed) K." That was evidently nonsense because we were then standing directly below the fortress and heard no kind of fighting noises. The battalion commander therefore declined to send his command into the fortress. A captain of the 136th infantry regiment who had brought the despatch declared that he would go up into the fortress with his command. But since his company was guard to the armored train stationed at Molsheim the officer in charge of the armored train asked him to replace the train guard at once. The battalion commander then advised him to follow his (the general's) own unarmored train and he would be safe there. The order was then given: "The train runs to Lutzelshausen without stopping." Orders were given to the bugler on the locomotive to sound, in case of attack: "Forward, double time," upon which signal all were to attack in direction of the enemy fire. But we arrived at the outskirts of Lutzelhausen without being disturbed. At the telegraph station the battalion commander had copies made of all telegrams passing through and experienced samples of all the fables of 1001 nights, for instance: "The little Donon has just been captured by the enemy." A field outpost west of Lutzelhausen reported: "I have drawn back because being attacked on both flanks I was unable to hold out." Inasmuch as there was total absence of any casualties the highly imaginative detachment commanders concerned were peremptorily ordered back to their posts and had their attention invited to the articles of war.

Cause of the mass delusion that had taken possession of the whole Breuschtal valley was as follows: a number of "know it all" frontier customs officials, who had listened to fabulous rumors of enemy forces approaching and having been seen in the valley, had rushed back from the frontier with excessive speed in their automobiles and spread these rumors with the usual additions at every station on their route and further claimed that the enemy were following directly behind them and the officers in charge of the frontier outpost and of section fortress K. W. II had accepted these rumors without investigation and without even inquring into their source. As an actual fact it turned out that the enemy had some days previously drawn back ten kilometers from the frontier and on the day of this commotion was not anywhere nearer than that from our stations and had displayed no disposition to attack.

Heavy-firing panics occurred almost nightly during the first month of field activities at the beginning of the World War in the west. One of the worst happened on the day of our first touch with the enemy on August 9, 1914. The Seventh Army was in march southward in southern Alsatia toward the Swiss frontier. The 30th infantry division was advancing in the direction Meihenheim—Ungersheim—Ballweiler toward Wittelsheim. Very few rest stops on the route had been indicated in the corps marching order in the prevailing August heat. The XV Corps order was generally: "The march will go on

through without interruption; whatever falls by the way remains." Thus there occured heavy marching casualties and the men were subjected to the utmost physical and nervous strains. Safety of the valley of Thann, against which the enemy had sent out feelers, had been placed in my charge, for which I posted a small guard on a height between Sennheim and Wittelsheim. The enemy attacks were easily repulsed. The bulk of the 30th infantry division was in bivouac at Wittelsheim. From the height mentioned we perceived that, to all appearances, hell had broken suddenly loose in Wittelsheim. A fire of infantry, artillery, and machine guns was raging and brilliantly lighting up the village in flashes. All were apparently firing like maniacs in every direction and alarming noises of firing sounded from all sides. An advanced guard battery had arbitrarily faced about and was beginning to lay a scientific line of shrapnel fire over Wittelsheim; it changed direction at once toward Thann. We were under the impression that the VII French Corps had possibly advanced towards Wittelsheim from the direction of Mühlhausen and we prepared ourselves to intervene. Then there was heard, after about a half-hour interval, the signal: "Cease firing" and the "Assembly." The ghost was laid but only after very material losses and casualties had been incurred, among them one regimental commander. This was the first firing panic that we experienced. The causes that gave rise to it have never been satisfactorily explained.

On the night of August 21-22, 1914, a replacement brigade assigned as auxiliary to the 60th infantry brigade, which had for the first time come in touch with the enemy, began, while in bivouac in a forest at night at Alberschweiler, suddenly firing insanely in all directions. I called out to officers whom I was able to reach to make utmost and continuous use of their drill service whistles and we thus succeeded in silencing the concert but only after thirty-four men had been killed.

Thus far the examples of panics are cited by General von Altrock. Those which follow are extracts from some of the articles contributed by readers of the *Militär-Wochenblatt* who responded to the invitation published in the issue of October 11, 1928.

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The Battle of Specters. By Colonel von Notz, German Army, Retired. Almost at the same time as the occurrence of one of the worst cases of panic alluded to in General von Altrock's narrative—that of August 9, 1914, in Alsatia—there occurred a similar instance at the uttermost eastern section of the German domain in the night of August 7-8, 1914, when the Eight German Army was being mobilized for the defense of East Prussia against Russian invasion.

A battalion and a battery were on the march eastward toward the German boundary where other troops had already been assembled. All at once a shot was heard. The prevailing darkness prevented any clear outlook. The infantry had time to arrange a fair deployment from the marching column but the battery unlimbered at once and went into action where it happened to be in the line and began a wild fire into the night. The excitement increased and the

infantry also began to shoot, but at what! No one knew; no one could see enything! Rumors began to buzz about: "Strong enemy cavalry has broken through" and "Two gray-horse Russian squadrons were seen in our rear." The blindly raging fire began to inflict casualties in our own ranks, especially among the battery horses. Wounded draft horses ran away wildly through the streets of the village which the troops had just left, spreading the panic to the trains of supplies following the command. The drivers of the trains lost their heads and fled in every direction. General order was gradually restored, although other troops on the way had been drawn away from their line of march and had lost valuable time.

Subsequent investigation indicated that not even small enemy patrol detachments were or had been anywhere near in this region at the time. A shot had been fired, but it was traced to an awkward member of the local railway station guard who did not know how to handle the firing mechanism of his rifle.

The Reverse of the Foregoing. An occurrence in the same region which happened a few days later is an example of conditions where the influence of a *man and perfect soldier* is exerted and felt. His iron will has been transmitted to his command. It was the 8th to 9th of August, 1914, when the Eastern boundaries were beginning to be menaced by the Russian mounted squadrons standing near by, across the boundary, for invasion. The weak boundary defenses at the station in question consisted of the second battalion 147th regiment, two troops of the Second Dragoons, and four batteries of field artillery. Our reconnaissance parties reported at Biala, on the morning of August 9, an entire division of Russian cavalry advancing. The enemy had, in artillery alone almost double that of our own force, but the Germans advanced against them at once. The Russian artillery was soon broken down by the well directed fire of our own batteries. One enemy battery was entirely destroyed; another succeeded in escaping in part only. The Germans rushed forward to the assault and forced back and broke through the enemy line, capturing seven guns and many ammunition wagons. The officer in command of the troops engaged was Colonel Nitsch, who lost his life a few months later in an attack against Rawka in Poland. It may also be noted that the troops concerned in the debacle of the night of August 7-8 fought with distinguished bravery and endurance throughout the sanguinary six-day battle of Tannenberg from August 24 to 30, 1914.

The Influence of Drill on Panic. From the diary of Captain Stollberg, may I be permitted to recall an incident of my campaign experience that shows how a panic was overcome by adaptation of an expedient of the drill.

It was in 1916 during the sanguinary struggle against Verdun. After we had succeeded in shooting breaches into the north front we were brought down into the valley of the Meuse. We were to take station at the Forges water course even though the so called "Dead Man" commanding an outlook and oversight over the valley area was still in possession of the enemy. Warnings on my part in regard to this menace of our position were disregarded by higher authority. We went out under protection of a foggy morning and began to dig

in, building field fortifications and trenches. I was well forward at an observation station but went back to my battery in anticipation of trouble when the fog began to lift with the advancing sunlight. I had barely arrived there when a number of shots from enemy artillery began to puff over the depression of the valley. They were at once followed by a hail of bullets striking into the midst of our workmen at the entrenchments and well directed artillery shots began to fall incessantly into the midst of our position. Injured men were crying out and wounded men squirming on the ground. Words of command were given out but were unheard in the hellish noise that prevailed of cries, curses, oaths, and general confusion. Merciless bullets and artillery projectiles continued to strike into the bewildered and chaotic mass. By an instinct which I cannot yet account for I seized my service whistle and sounded on it a loud service call; the peculiar shrill call was heard above other noises and attracted attention. Drill had achieved its own. The call, heard hundreds of times in the barrack yard was heard and listened to; the confusion abated. Commands were given out and obeyed and the command was withdraw to near-by cover. Thanks to a momentary cessation of enemy fire we succeeded in bearing away our wounded before their fire began again with renewed fury.

Panics in 1914 and 1916. By Lieut. Col. Benary. The 28th Infantry had entered Mühlhausen in the hours of the afternoon of August 10, 1914. The division staff and the commanding general's staff were quartered in one of the large hotels on one of the principal streets; the staff of the 28th Field Artillery, to which I belonged, was in the Continental Hotel, at the railway station. Toward evening vigorous firing occurred suddenly in all parts of the city. My battalion commander and myself, suspecting a French attack, went at once to our division headquarters. We perceived, however, while still on the way, that it was a case of panic. Shots were coming from some of the houses; individual soldiers on the streets were firing off their rifles senselessly, mostly into the air. The firing gradually abated. A company of the 169th Infantry, led by company officers, marched through the streets of the city singing the national anthem and contributed by their dignified bearing much toward restoring order.

The causes of the panic have never been clearly and satisfactorily explained. One battery commander effectively silenced the tumult of firing in one of the suburbs where his battery was in camp by unlimbering a gun and firing a solid artillery projectile at and through a house from which shots had been fired.

A similar panic, that occurred at Lyck in East Prussia on October 14, 1914, was related to me in post-war times by an officer who was an eye witness of the occurrence. The 49th Reserve Division had taken the north fringe of the city on the evening of that day after severe fighting. The opponent had taken a new position directly south of the city on the Lyck river. While the reserve regiment 226 was engaged in driving the enemy out and continuing the attack in a southerly direction toward Syba, almost the entire remainder of the division was assembling on the extended area of the market place and the streets adjacent. When evening was setting in, all these troops were engaged in preparing their

evening meal and feeding their horses. Suddenly shots were fired from a house near a church and from the church itself. At the same time the fight near the southern end of the city was renewed. The troops believed that they had been subjected to a surprise attack and an abominable confusion set in. Firing began here and there on the streets, horses and teams ran away, the troops at the northern end of the city began to retire, and restlessness and confusion and disorder spread far to the rear among baggage wagons and supply team columns. Intervention of officers soon restored order in the city.

The Brusilow offensive in the summer of 1916 was a generous breeding place of wild rumors and sensations. Thus I barely escaped on one occasion the loss of all my guns because the Hungarian Honveds in position directly in my front had, on the cry: "Cossacks are coming," abandoned their places without firing a shot or notifying me of their intention and had made it possible for Russian cavalry to rush into my position from the rear before I could reach my guns. Fortunately, the Russians disappeared as rapidly as they had come on when, with the assistance of a Honved squadron that had held its place I opened fire upon them.

Two days later a Croat division repulsed the attack of a Russian cavalry division coming on in close order at early dawn. But in spite of this repulse the entire baggage and supply contingent stationed directly in rear of our first line ran away in wild disorderly flight and thereby broke down the wire connection between myself and my battery so that I could only stand helplessly by as a spectator of the fighting panorama.

The panic impression prevailing permeated also the German troops. The excellent rifle battalion of my division was put in as a relief of Austro-Hungarian units for counterattack but became involved in the general mess of the retreat in spite of brave resistance and heavy losses. The battalion commander, a brave elderly gentleman of the reserve, came riding up at full gallop to the division commander and reported: "Your excellency, I am the last survivor of my battalion!" The division commander, without change of countenance or of any gesture indicative of censure or reprimand, said to him: "You are mistaken, Major, your orderly is still with you." The brave old major recovered himself, turned about and rode back to his place as rapidly as he had come, collected his men, and succeeded in closing up the gap that had been formed.

EDITORIAL

Rotation of Officers in Battery Training

RECOMMENDATIONS are being made in certain quarters which, if adopted, will lead to the evolution of a system of rotation of battery officers among the various classes of weapons now being manned by the Coast Artillery Corps. In this connection, it is pointed out that there is even now a heavy demand for officers trained in the methods of fire of antiaircraft artillery and that this demand will be so greatly increased in the event of war as to prove decidedly embarrassing unless a greater number of our junior officers are given training in such methods. To a lesser extent the same embarrassment will be felt in railway, tractor, and fixed artillery and in submarine mining. It would therefore seem advisable to devise some method which would assure the training of battery officers in antiaircraft artillery and in as many of the other classes of artillery as may be practicable.

In support of this argument, the following statistics have been compiled from the reports of target practice held in the Coast Artillery Corps during the years 1925, 1926, 1927, and 1928. In these four years two hundred and twenty-one officers fired some form of target practice. There is a total of six hundred and sixty-four officers (captains, 276; first lieutenants, 229; second lieutenants, 159) carried on the Coast Artillery list who should receive training in firing a battery. When it is noted that only one-third of our battery officers are given an opportunity to conduct target practice in a period of four years, the importance of an exchange of officers serving with batteries among the different classes of artillery becomes at once apparent.

The following percentages are based upon the two hundred and twenty-one officers who fired practices in the past four years:

a. Percentage of officers who have conducted an antiaircraft target practice and also a seacoast (railway, tractor, mines, fixed) practice: 8.6 (19 officers).

b. Percentage of officers who have conducted an antiaircraft target practice: 30.8 (68 officers).

c. Percentage of officers who have conducted a target practice with both tractor and seacoast (railway, mines, fixed) artillery: 8.1 (18 officers).

d. Percentage of officers who have conducted a target practice with tractor artillery: 21.7 (48 officers).

e. Percentage of officers who have conducted a target practice with railway artillery: 8.6 (19 officers).

f. Percentage of officers who have conducted a mine practice: 11.3 (25 officers).

g. Percentage of officers who have conducted a target practice with fixed seacoast armament: 52.4 (116 officers).

h. Total number of organizations having target practice with water targets: 73; total number having target practice with air targets: 31. It should be noted that in four years 68 of the 221 officers who fired a target practice had a practice with antiaircraft artillery, and during this time only 19 out of the 221 had both antiaircraft and seacoast training.

Recent instructions sent to the overseas departments directs the training of officers in more than one class of artillery whenever practicable. There, with the close grouping of antiaircraft and other artillery, it is frequently possible to change the assignment of an officer without expense to himself or to the government. In the continental United States, however, it is more difficult to work out a reasonable plan of exchange which does not involve too frequent changes of stations.

The small number of officers on duty with batteries, the demands for officers for duty away from troops, and the length of normal tours of duty make it improbable that any scheme can be evolved to assure training of battery officers in all classes of artillery. A minimum requirement would seen to involve training in antiaircraft artillery and one other class, as railway, tractor, or fixed. The pressing need—present and future—is for officers trained in the technique of antiaircraft artillery. Officers who have not had such training should anticipate the future by requesting antiaircraft assignment on their preference cards. By so doing they will assist in the scheme of rotation and will prepare themselves for assignment to one of the most important duties of the next war.

A New Editor

With the appearance of this issue of the COAST ARTILLERY JOURNAL, the present editor brings to a close his four-year period at the editorial desk and surrenders the editorial pen. The regret which he feels at leaving a most interesting duty is tempered by the pleasure he takes in being able to announce that the destinies of the JOURNAL are to be placed in the capable hands of Major Stewart S. Giffin, who is too well and favorably known to the Coast Artillery Corps to require an introduction.

Major Giffin brings to the JOURNAL an incisive and facile pen and a talent which has been developed by a varied experience. He is a recent graduate of the Advanced Course of the Coast Artillery School and of the Command and General Staff School. His more recent duties with the Organized Reserves has given him a sympathetic understanding of the needs of that component of our service which will go far toward enabling him to meet those needs.

We have no doubts for the success of the JOURNAL under his direction, and we bespeak for him a generous support from the members of the Coast Artillery Corps. The duties of an editor, like those of any other position whereof the success is a question of voluntary cooperation on the part of others, may be-

come thankless duties. An editor alone cannot produce a periodical; he only selects and arranges his material. To produce a magazine of real value and interest, two things are required: contributors and readers. It has been remarked before in these pages that practically every officer in the Corps has had some experience, has devised some method or apparatus, or has investigated some subject which would be of interest to others. Were these experiences, designs, or investigations to be written up and submitted, the character of the JOURNAL, through selection and publication of the most interesting and elimination of the least interesting, would be so greatly improved that the questions of subscribers would cease to be a question. Under new conditions, in new surroundings, and with the support of the Corps, the JOURNAL will, we trust, flourish as never before.

Great powers, well armed and having a vivid sense of opportunity, supported by popular clamor for the vindication of national interest, are disposed to seize what they believe to be within their grasp. Resistance by force means war. . . . Thirty-five years ago the most distinguished of publicists found some promise of peace in the alliance of the three emperors and in the consequent isolation and agreement for peaceful adjustment of a limited group of questions which otherwise might lead to conflict. But time has shown how illusory are alliances of great powers so far as the maintenance of peace is concerned.—Secretary of State Charles Evans Hughes.

PROFESSIONAL NOTES

Commissioned Personnel, Office Chief of Coast Artillery

Chief of Coast Artillery
MAJOR GENERAL ANDREW HERO, JR.

Executive
MAJOR HENRY T. BURGIN

Organization and Training Section
COLONEL H. L. STEELE
LT. COL. W. S. BOWEN (relieved 6/29)
MAJOR J. H. COCHRAN (not yet joined)
CAPTAIN J. H. WILSON

Gunnery
MAJOR S. JARMAN

Personnel Section
MAJOR H. T. BURGIN
CAPTAIN H. N. HERRICK

Plans, Finance, and Materiel Section
MAJOR O. L. SPILLER (relieved 6/29)
MAJOR C. H. TENNEY
MAJOR J. B. CRAWFORD (not yet joined)
CAPTAIN F. J. MCSHERRY

Intelligence Section
MAJOR ROBERT ARTHUR (relieved 6/29)
MAJOR S. S. GIFFIN (not yet joined)
CAPTAIN H. N. HERRICK

Service Club House

The Women's Army and Navy League has established a Service Club House for enlisted men of the Army, Navy, and Marine Corps, at 1015 L Street, N. W., Washington, D. C. This club, situated in the heart of the city and within easy reach of Union Station, Capitol, Library of Congress, Government offices, theaters, and business section of Washington, provides sleeping rooms, well equipped bath rooms, showers, meals, and wholesome recreation for our service men.

Since the cost of the establishment and the upkeep of this club have been and will continue to be met by those having the interests of our enlisted men at heart, the services of the club will be provided to soldiers, sailors, and marines at merely nominal prices.

The club house is a large attractive and spacious building, fronting on L Street and Massachusetts Avenue and also on 11th Street, which street has a car line.

Enlisted men of the Army, Navy, and Marine Corps, visiting Washington either on official business or on personal matters, will find a clean, attractive, and convenient home during their stay in the city, where they will not only receive courteous attention but where they will be in environment to which they are accustomed.

This club house not only fills a long-felt need but is a distinct credit to the service.

The above information is furnished to the end that all enlisted men, temporarily in Washington, may be acquainted with the facilities which have been made available for their comfort and convenience under the kind auspices of the Women's Army and Navy League.

The JOURNAL has been informed that the privileges and services of the Club House will likewise be granted to members of the Coast Guard and trainees at Summer Camps.

A Criticism of Criticisms

A writer over the signature "178" gives an expression of his views on this subject in the March 25 number of the *Militär-Wochenblatt* which, taken in connection with the editor's comments on his contribution, are well worthy of notice. The writer's views are, in substance, as follows.

Criticism is the essential element of military literatures and is based on the fact that the art of war is a science and criticism is necessary for the development of every science. Intolerance of or impatience with criticism is an infallible sign of the beginning of obsolescence and of calcination. We find, however, when looking over our military journals, contributions that are not wholly free from objections in their methods of criticism. We are today in the era of an enormous literary activity. Many officers take in hand a criticizing pen to announce points of view on matters that seem amiss to them generally and frequently in caustic language. Criticisms coming from the ranks of the younger are a welcome manifestation of something better than distinterestedness, but the young man, passing judgment on that which seems to him old and outworn, fails to remember that in a very few years he will also be classed with the elders. But the asperity of youthful critcism would not be so acutely felt if it avoided trivialities and confined itself to greater and more important issues than are usually brought out. I mean by this that there is a tendency in our present military literature to dwell on subjects that approximate those of the after Frederician period as, for example, where an officer writing about a drill regulation that fixed the marching tempo at seventy-five steps per minute remarked: "After mature thought and much observation I have reached the conclusion that sixty-seven steps per minute are much better," and proceeded to strengthen his point with an elaborate argument. While we may look with an indulgent smile upon such examples it may not be out of place to consider, when examining some of the military literature now being published, whether we may not be reverting to era of elaborate discussions of the trousers buttons and knapsack straps. The younger generation is turning its attention to minor inner service matters. May we not consider whether in their criticisms on some of those subjects the writers are not fully justified in endeavoring to pass judgment on the question at issue for want of that most essential qualification—experience? A lieutenant may, for example, be more competent to write interestingly about mobilization than about the expediency of the Sunday furlough for recruits and let his captain worry about the latter. Would it not be well for the generation of today, which is so earnestly striving for clarity and reality, to admit the old truth that even good human common sense cannot wholly take the place of experience?

The young officer would do well to refrain from fault-finding criticism of an ill-fated field-service exercise and direct his attention to the great problems of today and tomorrow upon which he can, aided by his youthful want of burdensome prepossession of ideas, exercise his critical faculties with an unimpeded clearness of spirit and thought. The young officer should write over his "thoughts about the future" as a heading the monition: "Reports concerning future experiences are left to the elders."

* * * * *

The comments of the editor of the *Militär-Wochenblatt*, General von Altrock, on the article of which the foregoing is a condensed synopsis, are:

"We gave room to this writer because we did not desire to stand in the way of criticism even when it is a criticism of criticism. Criticism is treated in many different ways in different armies. In France there prevails a happy and distinct freedom of expression concerning military matters, even in regard to those pertaining to existing service regulations. Those were very materially influenced in their origin and formation by criticism. This applies especially to their excellent artillery regulations which were the subject of much criticism by artillery officers and especially of captains of artillery. An equal freedom of criticism prevails in England. The important lectures of the United Service Institute are

in fact published with the criticisms of them which are frequently more informative than the lectures themselves. In the U. S. A. military critcism moves in channels which are wholly unimpeded, as is shown by numerous examples.

"In the old Prussia criticism was officially disrelished. Read in Clausewitz's *Catastrophy of 1806* where he sets forth that every view opposed to existing conditions was openly declared as 'pessimistic' and was suppressed. Read Scharnhorst's complaints on this subject. One may recall that before the World War pessimists were not be be endured in the State. Were they pessimists? Were they not, perhaps, the voices of warning uttered from a conscientious sense of duty by men who had a better insight into that which was to come than was possessed by the mass of the population and by the greater portion of those in positions of authority in the State? It is the same with us Germans today, when fate is on our necks. Beware of awakening unrest! Do not awaken him who has happy dreams! That waking up may find us being submerged is a *cura posterior. Caveant consules.*

"These reflections are addressed to the entire press, including military journals. But military knowledge and capacity includes highest, high, and medium problems. Of the last named the great Frederick says: 'Take care of details they also have their merits today.' One must not regard them as insignificant and deny them criticism. Youth practices on them in its ascent to higher aims. Let us not press down too hard on the safety valve of youthful steam power. Reflections on 'the workshop of the squad' or about 'maneuvers' are, as fully entitled to notice as are those about strategic and high tactical problems, for example. For this reason the editorial management of this journal will be delighted when the young officer, taking pen in hand for practice on minor affairs, rises to spiritual heights."—G. R.

Military Preparation of Italian Youths

The *Militär-Wochenblatt* of February 25, 1929, quoting from the Italian journal *Ecercito e Nacione* for January, 1929, publishes the following on measures taken by the Italian government to prepare and train youths for the military service of the nation and incidentally to improve the younger generation physically and culturally.

The organization is called Opera Nazionale Balilla and General Renato Ricci stands at its head. It has been in existence about three years and owes its origin to Mussolini's own personal efforts. The Balilla has its local groups in every city and its members in every village. The training is in the hands of the active militia officers.

Composition: eleven members form a *quadra* (corporal's command); three quadras, a *manipel* (section or platoon); 3 platoons, a *centurie* (company); 3 centuries, a *cohort* (battalion); 3 or more cohorts, a *legion* (regiment). The total strength of these youthful regiments, which is continually increasing, is at present 1,119,526. Distribution according to age is: *avant guardisti,* ages from 8 to 14 years; and the real *batilla*—the youthful defensive force—from 14 to 18 years. There is a distinction in the training of these organizations for army and navy service. There are the following subdivisions of groups within the legion: the ski runners, the machine-gun and antiaircraft riflemen, the flyers, and other specialists. The naval legions are engaged principally with sailing and bridge-building exercises. The naval legions are especially well organized and are admitted by Turati to be standards of excellence. "The future of Italy is in the seas that were once upon a time traversed by the glorious Roman triremes."

The ski runners have their fields of activity naturally in the extended Alpine regions of upper Italy. The first legion has its base in Rome. Bozen, Trentino, and Meran are special *points d'appui.*

The machine-gun and antiaircraft riflemen comprise about 3000 youths distributed over 18 antiaircraft circuits. They are attached to the antiaircraft inspection organizations of the army and receive theoretical and practical training in antiaircraft gun and machine gun exercises.

The flyers are trained in annual courses of groups of 100 youths. Flying officers and technical civilian instructors lead these courses

Composition of the usual legion: Every legion has one cohort composed of specialists. The ordinary cohort is made up of centuries of signal men, bicyclists, visual signalists, radio telephonists. There are, in addition, special intelligence centuries, with signal men and motor cyclists. There is with each legion a technical section with builders of water supply works, huts, and barracks. This training takes place twice each year and on Sundays.

But the principal training season is in Summer when the legion is assembled in camp and its time is taken up wholly with military exercises, excursions, travel, sports of all kinds. Five thousand youths took the camp course in 1928. Every province has its own camp arranged for a twenty-day period. There are, in addition, so called "week-end camps" which are available from Saturday evening to Monday morning to young men employed during the week. The youths' defense training has also been introduced in the colonies. More than 1000 were in training in Lybia in 1927 and as many more in the Eastern port cities of the Mediterranean.

The balilla has for its purpose, aside from military preparation, caring for the promotion of education and fostering the culture of the youths under its control. This is greatly enhanced by general training and progressive educational and vocational instruction of all kinds and aided also by extended systems of financial assistance to needy individual cases. Balilla has its own press.

The youths arc taking part in this movement with great enthusiasm and exercise disciplinary control in manliness and deportment over their membership. They wear a distinctive uniform. The whole organization is an admirable and powerful instrument of progress, owing its origin to the gifted genius of Mussolini.

The German writer adds to all this thc rcmark: "*And where is Germany?*"—G. R.

An Austrian Estimate of the Russian Grand Duke Nicholas

The *Oesterreische Wehrzeitung* of January 11, 1929, has this to say of the late Russian grand duke: A few days ago the former generalissimo of the Russian army died at Antibes in Southern France at the age of 72 years. With his decease one of the most distinguished leaders of the World War passed away.

Nikolai Nikolaijewich, son of the same-named field commander of the Balkan wars of 1876-1877, distinguished himself as a young officer of the Shipka Pass campaign. He was a brilliant, soldierly figure of remarkable size and bodily strength, inspired with his vocation as a soldier, of strong will power and reckless to the verge of brutality. As ardently as he loved Russia did he, as leader for a long time of the Russian war party, hate everything German, including Austria-Hungary. When Russia was finally steering more and more toward war it was the work of the grand duke to overcome, after a long period of resistance, his nephew the Czar and induce him to yield.

Nothing in the way of criticism can certainly be said against the plan with which the grand duke, as generalissimo, went into the field at the head of the Russian millions in 1914. Either the Gallician and the East Prussian bastion, at least one of the two, had to be overcome before one could comply with France's desire for an advance in the direction of Berlin. The fact that success with that plan was not forthcoming was due to the power of resistance of the opponent, but also no less to the pecularity of the Russian army whose unwieldiness a man of the energy of the grand duke was unable to overcome. It is sufficient, with respect to this feature, to read the mcmoirs of Daniloff, who worked in the direct environment of the grand duke field commander and can be counted on as a reliable witness of the first rank. The grand duke endeavored in vain, until well into the Spring of 1915, to eradicate from his generals the feeling of timidity that had gained possession of them after Tannenberg, against entering upon German soil. And when he finally yielded to Ivanow's pressure it was six months too late. In the meantime, the shortness of supplies

of ammunition and of arms began to jolt the structure of the army and even the certainly great force of the grand duke was unable to resist the influence of the slow jog trot routine of the administrative system and of the corruption that was beginning to pervade well up into the highest branches of the life of the state.

Gorlice began to undermine the standing of the commander in the field. Even though the grand duke again and again succeeded in withdrawing the whole Russian army or certain material parts of it from threatened disaster, the fatality of defeat had begun to impair his prestige as commander. In the beginning of September, 1915, the Czar took over the command of the army in his own person and the grand duke was given the command in the Caucasus. A renowned French military writer sees in this transfer of the grand duke the real beginning of Russian misfortune.

When the revolution broke out, various Russian military circles hoped to achieve through Nikolai Nikolaijevich the restoration of the fatherland. But in this they were disappointed, although the grand duke played an important rôle in the ranks of the Russian emigrants after his flight to foreign lands. Death has, in him, taken from the world a man who was once arrayed as one of our most dangerous enemies but one whose weight in the scale of history we cannot question.—G. R.

Military Training of Women in Poland

The *Militär-Wochenblatt* of February 18, 1929, contains an article on this subject from which the following extract is here given. The training began several years ago and is largely due to the propaganda that is being continually fostered in Poland that it would be of great importance in the future war that Poland anticipates and intends to be prepared for. The entire training course is divided into three periods through which every woman offering herself voluntarily must pass in order to be available for military service in war. The first period includes promotion of physical fitness and adaptability. Every woman who passes this course receives an official distinctive sport badge from the state. The second period embraces the so called general military training. It consists of educational work as well as of acquisition of general military knowledge. Lecturers furnish the hearers with a general representation of army organization, of the duties and of the inner life of the army and endeavor at the same time to impress each woman with the army spirit in its military sense. In these lectures anti-gas and anti-flyer defense is also treated of and the handling of all kinds of war weapons is worked out. In the third and most important period special training of women in the different branches of the military service is taken up. This covers various courses as, for example, sanitary, telegraphic communication, reconnaissance, subsistence supplies, and replacements. This course is participated in by women who have offered themselves for special service in the army in case of war. Completion of the three training courses provides the women taking them with the possibility of taking a suitable place in the military service in war.

The state, of course, provides all the facilities for the training and ample provision is made for carrying out its details and rendering to each organization the necessary assistance such as providing implements and weapons for military exercises, exercise grounds and firing fields, etc.—G. R.

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FURTHER ASPECTS OF MECHANISATION. By Colonel H. Rowan-Robinson, C. M. G., D. S. O., *p. s. c.*

Memorial de Artilleria, March, 1929

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PALESTINE. By Field Marshal The Viscount Allenby, G. C. B., G. C. M. G., D. C. L., LL. D.

THE "MECHANIZATION" OF FLEETS AND ARMIES. By V. W. Germains.

BOOK REVIEWS

Textbook of Ordnance and Gunnery. By Earl McFarland, Professor of Ordnance and Gunnery. New York: John Wiley & Sons, Inc. 1929. 5¾"x 8". 625 p. Il. $6.50.

Without a doubt Colonel McFarland has filled a timely need. The advances in ordnance manufacture and ballistic methods during the past decade have rendered obsolescent many other excellent treatises dealing with the subjects of ordnance and gunnery. All military men will welcome this new book. Its value will accrue not only to those of the Regular service, but to all officers of the National Guard and Organized Reserves, whatever their branch.

A most noticeable feature of this book is the balance which exists between the theoretical and the practical. This is as it should be. The theoretical ballistician cannot long succeed without proving-ground justification for his interesting integrations. At the same time it must not be denied that the underlying sciences applying to gun and projectile design are worthy of a great deal of study and investigation. Colonel McFarland has included within his pages clearcut explanations of the applications of mechanics, physics, and chemistry to ordnance problems. At the same time, it is noted that his examples and exercises are based upon actual situations encountered in the arsenal and at the proving ground.

This method of attack is clearly demonstrated in his chapter on Explosives. He begins with a presentation of the fourfold characteristics of the effective explosive. His treatment of the subject of Work is very clear. From this first position he leads directly to a discussion of the fundamental laws of the thermodynamics of gases. The chapter closes with a summary of principles involved by applying them to the actual case of nitroglycerine reaction.

Turning to the discussion of interior ballistics, we note that the author has chosen to approach the subject by way of Le Duc's equations. It is believed that, for approximate results and also for a sufficient understanding of this subject, these equations are satisfactory. They are quite accurate, and whatever small errors might be involved are not in the direction of danger. One who has ever studied the more rigorous solutions of Colonel Tschappat will not wish to slight them in the least; but for the average officer they are most too formidable, and the calculations as demonstrated by Le Duc answer nearly all demands. The designer would undoubtedly resort to Tschappat's equations for final stresses. A further interesting feature of Colonel McFarland's work is a discussion of variations from standard conditions. This is quite important for the artilleryman, and the presentation which is given in this book covers such matters as changes in density of loading, changes in weight of projectile, erosion in the bore, and changes in temperature and moisture. All of these are problems often encountered, and an understanding of their effects is essential.

Of equal interest is the chapter on exterior ballistics. Siacci's method is the nearest that Colonel McFarland approaches to any of the classical aspects of this subject. The greater portion of his discussion is devoted to an explanation of the work of Dr. Moulton and his associates in the application of "short-arc" or numerical integration to the problem of the trajectory. To the average person, mere mention of this method of integration is likely to result in a feeling that it is something entirely too tedious for consideration. Truly, it does require concentration and accuracy for its application, but the method has opened up new fields of knowledge concerning the behavior of a projectile. The recent advances in exterior ballistics are due in part to this method of calculation, and its importance must not be minimized. Colonel McFarland has encompassed in just a few pages a very clear and direct explanation of this method.

These are just some of the interesting features of this text. To treat of all its excellent points would require more space than could possibly be allotted. There is a description of the various instruments employed at the proving ground, even to the solenoid chronograph. The chapter on metals used in ordnance construction goes into the question of radiographic examination of steels. There is a treatment of non-ferrous alloys. The various types of artillery, both mobile and fixed, heavy and light, are thoroughly described. There is ample information concerning fire-control instruments. The use of tables in firing is explained in detail. The types of motorized materiel are given thorough attention.

The appendix should not be overlooked. It contains a table of the chronological development of ordnance materiel. In addition to the usual tables in any technical book, there is a summary of the report of the Westervelt Board and a description of the German long-range gun.

The author has shown keen judgment in arranging the material in his book. It is especially noticed that in his discussion of motorization and other present day topics of ordnance progress, there is no tendency to include matters that are controversial. We must conclude that here is an officer who is worthy of his hire.—G. B. D.

Sound Off. Compiled by Edward A. Dolph. New York: Cosmopolitan Book Corporation. 1929. 7½"x 10¼". 621 p. $7.50.

Lieutenant Dolph has been engaged for many years in collecting the songs that have been popular in the Army, and this collection shows the result of great patience and much labor. Originally intended to include only the songs written and sung within the Army, the collection was extended to include military songs not written within the Army but adopted (and perhaps adapted) by the Army for its own. More than three hundred songs are included and these are arranged in sections that include the songs of today and of the World War, the Mexican War, the War of 1812, and the Revolutionary War. The final sections consist of selected songs from the regiments and from West Point—where many songs have been made. Many of the songs are prefaced by an account of their origin or by anecdotes connected with them. Many more are followed by parodies that have been popular.

Practically nothing has been omitted, if printable. Even the ribald Lulu has been included, although Lieutenant Dolph found himself unable to continue the words beyond the second line of the first verse. The music was arranged by Lieutenant Philip Egner, teacher of music at the Military Academy, and the sketches illustrating the volume were drawn by Lieutenant Lawrence Schick, of the Department of Drawing.

Lieutenant Dolph says: "In compiling this book, I have been prompted by two motives: first, to preserve such soldier songs as are now extant and to resurrect as many of the forgotten ones as I could find; and second, to give to the army and veterans' organizations a singable collection of soldier songs." He has succeeded remarkably well and the publishers have turned his collection out in excellent form. Song is a builder of morale, and every officer is interested in morale. Ergo, every officer should be interested in and should possess this valuable book of songs.

Lafayette in Virginia. Edited by Gilbert Chinard. Baltimore: Johns Hopkins Press. 1928. 7½"x 10¼". 64 p. $2.50.

When Major General the Marquis de Lafayette was sent to Virginia with a small detachment of Continental troops to check the British threat in that quarter, he was called a "boy" by the veteran Cornwallis, who had also proceeded to Virginia. Lafayette celebrated his twenty-fourth birthday during the siege of Yorktown, yet it is probable that no other American general officer could have conducted the Virginia campaign of 1781 with greater circumspection nor with greater success. Possessing the confidence, friendship, and trust of Washington, commanding in the North, and of Greene, commanding in the South,

Lafayette exercised what amounted to an independent command in Virginia under conditions in which he could very easily have made serious mistakes. That he made none was enough to silence any criticism of his selection by Washington for this important post.

In such of Lafayette's correspondence as has been published, his desire to win approbation and his extreme care to conciliate everybody is particularly to be noted. Lacking horses, he used oxen. Without clothing for the men, he pledged his own fortune. Tactfully urging State and Continental authorities, he secured what he could and prosecuted his campaign with vigor and success.

Much of the reason for his popularity and his success as a commander in the field may be seen in these hitherto unpublished letters which have been brought together by the Institut Français de Washington from the Virginia State Library and the Library of Congress. No narrative accompanies the letters, which were for the greater part written to Governor Jefferson, Governor Nelson, Patrick Henry, General Wayne, and Colonel Davis between February and October, 1781, but the letters themselves express Lafayette better than any narrative could.

The editor has been careful to retain the exact spelling and punctuation of Lafayette and even reproduces one letter in the chirography of the famous Frenchman. In publishing these letters the Institut Français de Washington has, to use the words of the editor, made "an important addition to the wealth of material already obtainable on the last year of the Revolutionary War."

L'Enfant and Washington, 1791-1792. By Elizabeth S. Kite. Baltimore: The Johns Hopkins Press. 1929. 7½"x 10¼". 182 p. Il. $3.00.

Pierre Charles L'Enfant is best known to the military service as an Army engineer who was employed at Fort Mifflin and elsewhere in the first coast defense project of the United States—that of 1792-1794. He had come to this country from France in 1777 as a volunteer and was commissioned the following year as a captain of engineers in the Continental Army. He served at Charleston and with the army in the south, reaching the grade of major before the end of the war.

L'Enfant, artist as well as engineer, was intensely stirred by the idea of designing a city when the site of Washington was selected as the National Capitol and he secured his own appointment for that purpose. He laid out the plans of the city, located the Capitol and the White House and all the many features which he felt the seat of government should possess. He was, however, high-handed and difficult to work with. He would take no orders from the Commissioners and insisted on his own schemes in every detail. He was finally removed, but not before he had completed the essential parts of his plans. The City of Washington as laid out was the city of Washington as designed by L'Enfant; and the Washington of today is a monument to the foresight which enabled him to visualize a completed city on the vacant fields with which the project started.

The name of L'Enfant has probably not been sufficiently associated with Washington; but when, more than a hundred years after L'Enfant had drawn up his plans, a Commission of artists was appointed to lay out the District of Columbia (as L'Enfant had laid out a part) the L'Enfant plan was readopted and applied to the entire District. It is to be hoped that the author of the plan will hereafter receive greater credit for his work.

The present book was prepared to show just what part L'Enfant played in designing the city. The work consists mainly of the original correspondence, connected by sufficient narrative to give the whole work a continuity which keeps the reader oriented at all times. The work is brought out under the auspices of the Institut Français de Washington, which was incorporated in 1926 for the purpose of promoting in the United States the study of French civilization, history, literature, and art and of preserving the memory of French contributions to the development of American civilization by publishing documents and other-

wise. In this, the third book published by the Institut, many published and unpublished documents are brought together for the first time, and the interest resulting from their association is enhanced by an Introduction by J. J. Jusserand, formerly ambassador of France to the United States, and a foreword by Charles Moore, Chairman of the National Commission of Fine Arts.

An Outline History of the Great War. Compiled by G. V. Carey and H. S. Scott. London: Cambridge University Press. 1928. 5½"x 7½". 279 p. Il. Maps. 6 Shillings.

When one takes a moment to count up the years that have elapsed since the close of the World War, one discovers with a bit of surprise that the young men who are now graduating from college can have no first-hand knowledge of the war and its effects. Even the oldest of them can scarcely remember the outbreak of war in 1914. Of those of us who participated, a few may still be considered young, but it will not be long before affairs will be dominated by men who had no part in the war. It will be well if they have some knowledge of the war—particularly of war atmosphere, of what men felt and endured and did.

With somewhat of this thought in mind, Major Carey and Captain Scott have prepared an outline of the war in which the utmost compression has been exercised. The narrative is restricted almost entirely to the British campaigns and battles, and in these only the main events are discussed. The result is a brief but clear exposition of the course of the war, one which does not take long to read. Sketches show the different areas in sufficient detail to enable the reader to follow the text intelligently, and each chapter closes with a list of three or four books for further reading on the subject matter of the particular chapter.

The book will serve its purpose. To the military student, its particular value will lie in the possibility of general orientation which it affords preliminary to further and more detailed study.

A Saga of the Sword. By F. Britten Austin. New York: The Macmillan Company. 1929. 5"x 7½". 322 p. $2.50.

Masonary claims for itself rank as the most ancient of professions, but the military profession can dispute the claim with some reasonable arguments. Both started from small beginnings and the origins of both are obscure. Mr. Austin, in his saga, goes back to the neolithic ages to discover the period at which "war came to the world." From this, as a starting point, he traces the development of warfare in a series of episodes which, disconnected as a tale, possess a thread of continuity in that each marks the end of one era in warfare and the beginning of a new. The victory of Alexander over Darius, the destruction of Carthage, the passing of the legion, the spread of Islam, the first Crusade, the introduction of cannon, Gustavus Adolphus, and Napoleon furnish the background for some of the tales and bring the profession of arms up to modern times. The World War brings warfare to the end of one epoch—that of man against man—and introduces that of machine against machine.

Mr. Austin possesses the faculty of vivid and concise writing. No extraneous matter mars the development of his theme and in the end we are left with a clear outline picture of the development of warfare.

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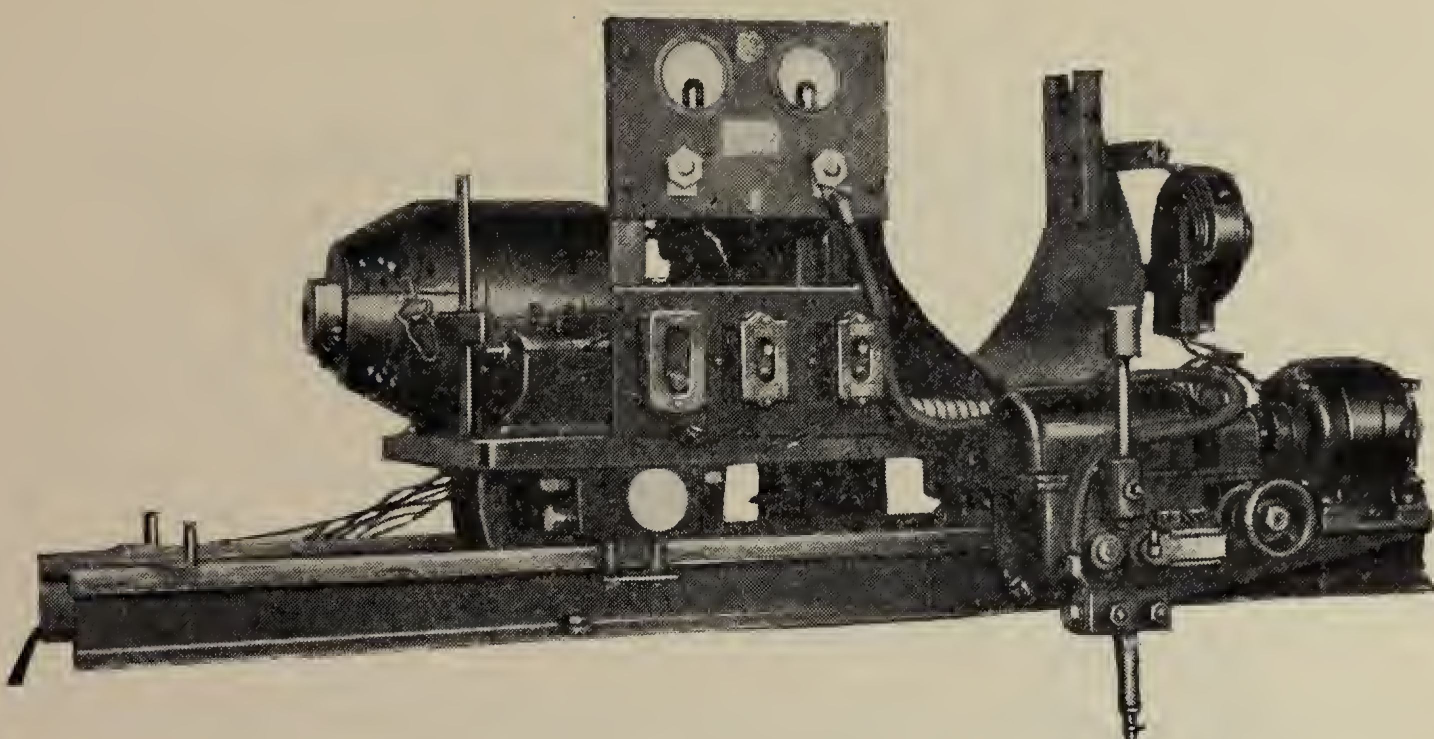

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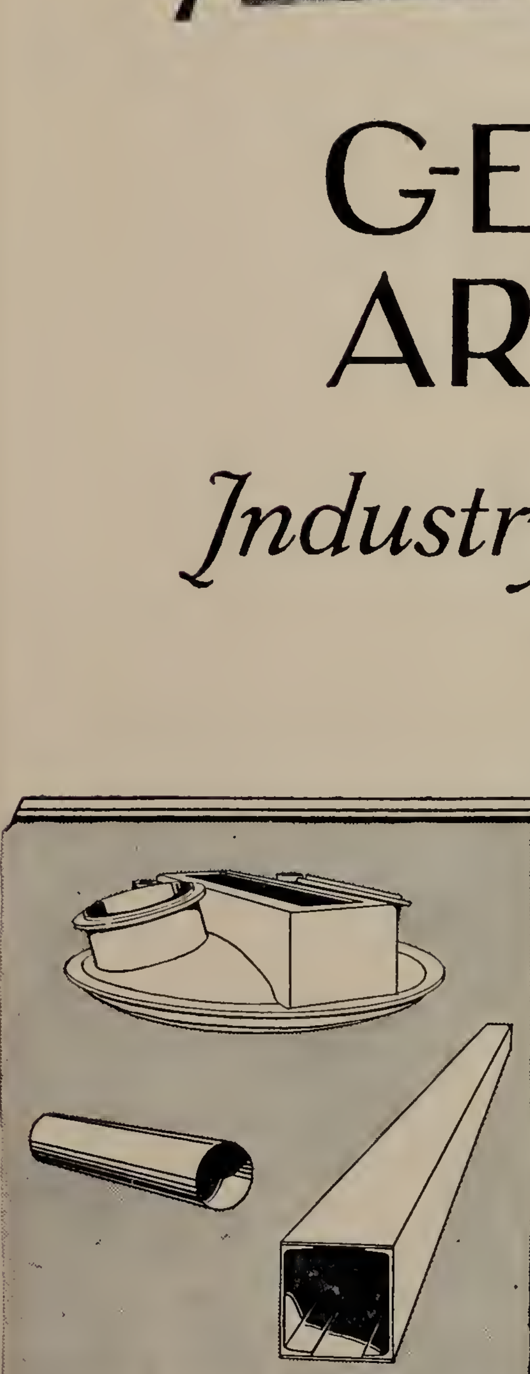

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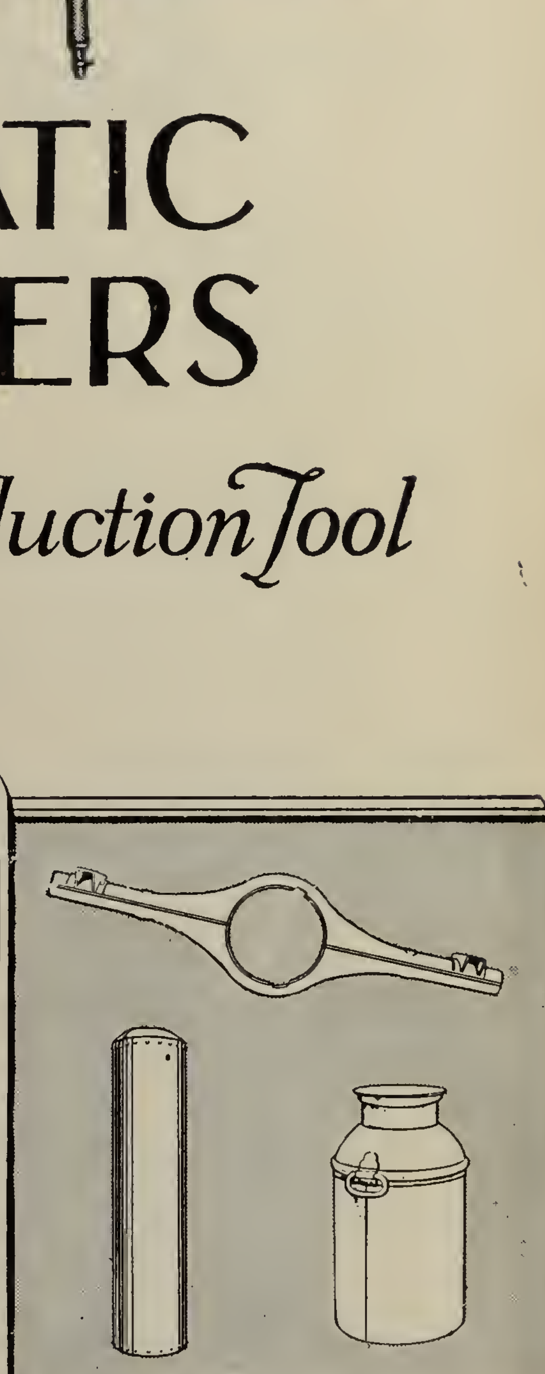

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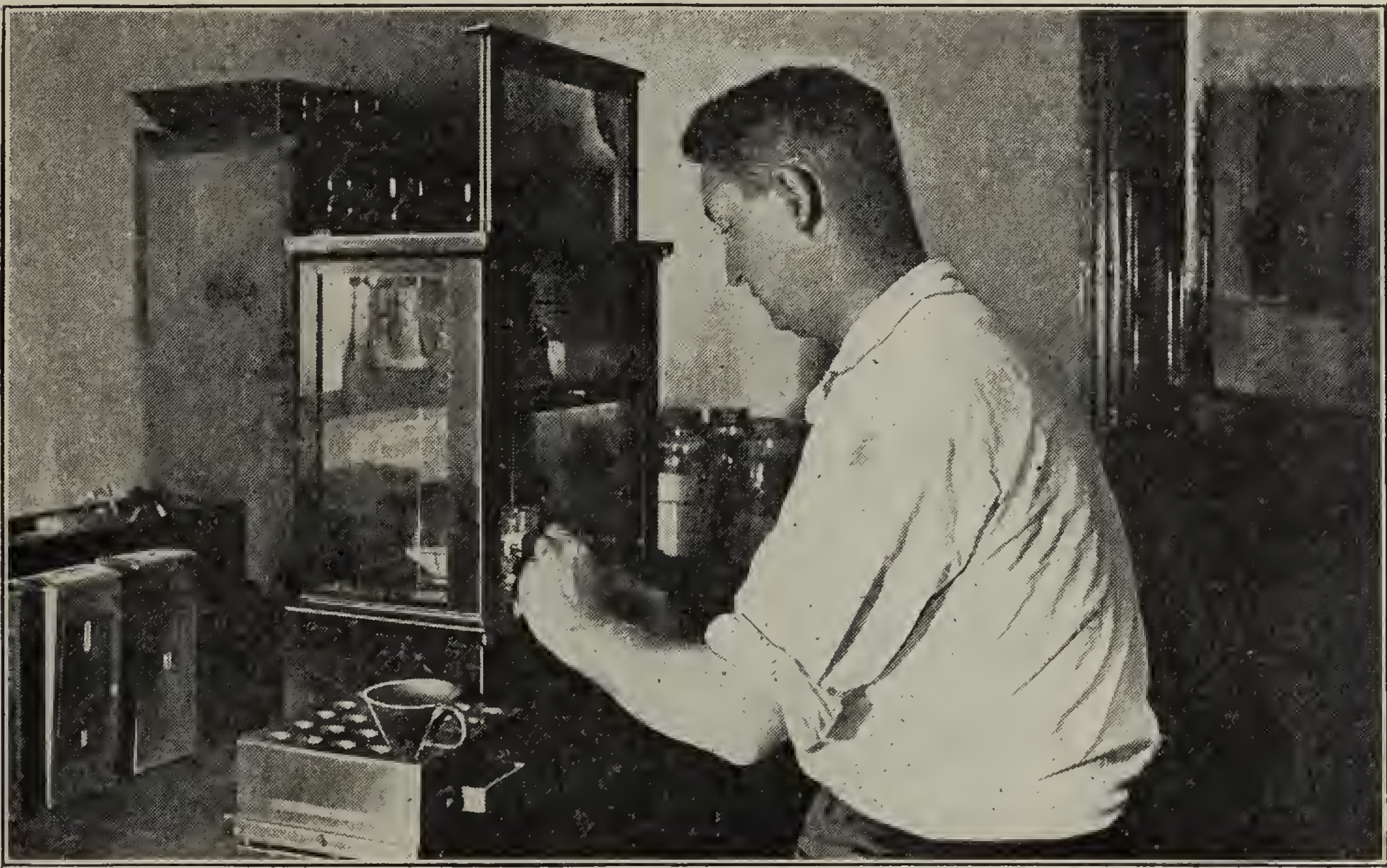

1

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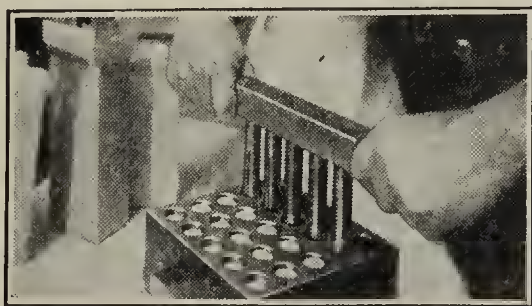
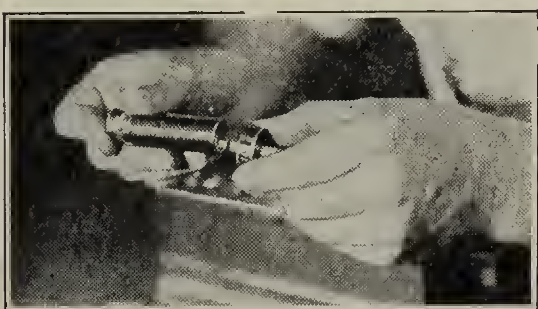
CONSTANT vigilance has to be exercised in preparing and making a proof test of all smokeless powders. Very slight variations in the loading of ammunition will introduce errors in the delicate measurements that are used to record the test results. The accompanying photographs are to illustrate the degree of accuracy which is followed in the loading operation.

Photograph No. 1 shows the actual weighing operation of each charge of powder for a series of a 20-round test. The powder is weighed on an analytical balance which is accurate to a hundredth of a grain.

Photograph No. 2 illustrates the care with which the wads are first loaded in the shells so that they will be parallel to the base of the shell.

Photograph No. 3 shows how each shell is measured for a uniform length of crimp.





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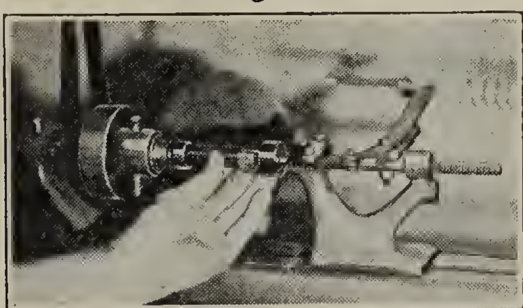

4

Photograph No. 4 illustrates how the crimp is finally applied. Note that the machine is semi-automatic in operation—the loaded shell being forced against the revolving crimping head by a constant weight applied through a system of levers.

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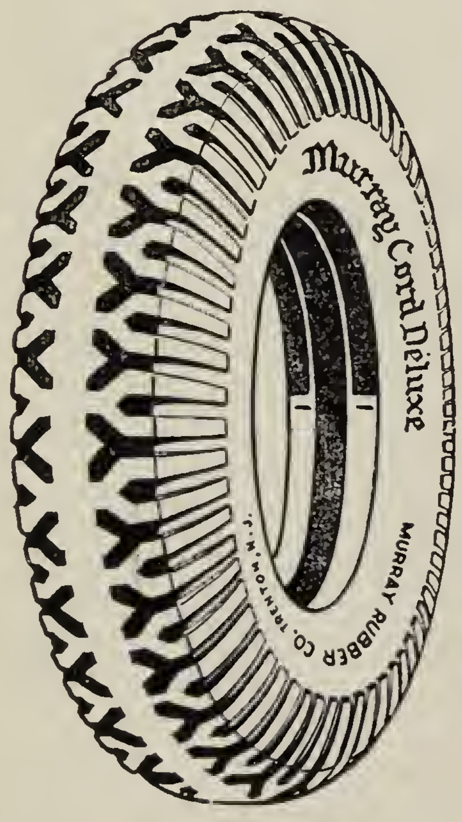

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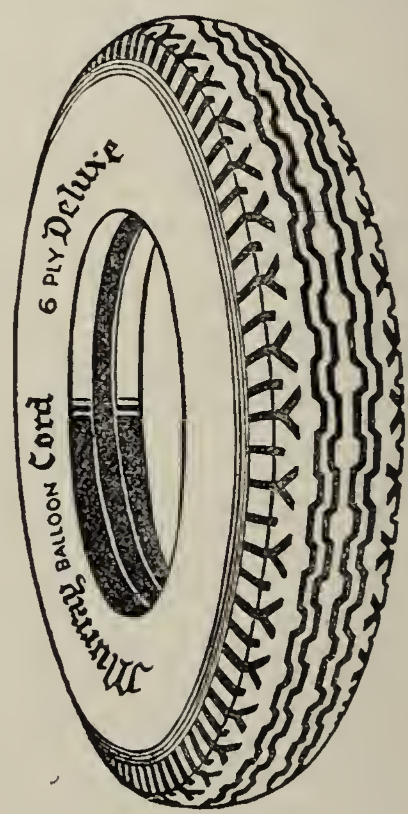

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(*c*) Award will be made by a committee of award, consisting of three persons, to be nominated by the Editor. If no essay submitted seems to the committee worthy of a prize, none will be awarded. Honorable mention may be made of any essay submitted which seems to the committee worthy thereof, but to which a prize is not awarded.

(*d*) All essays entered in the competition will become the property of the COAST ARTILLERY JOURNAL. These will be published, if valuable and interesting to JOURNAL readers.

(*e*) Copy must be typewritten, with lines double spaced, on one side of the paper only, and must be submitted in triplicate. If illustrations are included, one of the three copies thereof must be in the form of drawings, tracings, or photographs (not blueprints nor brown-prints).

(*f*) Copy must contain nothing to indicate its authorship, must be signed with a *nom de plume*, and must be accompanied by a sealed envelope containing this *nom de plume* and the name of the writer. This envelope will remain in the hands of the Editor of the JOURNAL and will be opened only after award has been made by the Committee.

(*g*) Copy must be received on, or before December 31, 1929. It must be addressed COAST ARTILLERY JOURNAL, 1115 Seventeenth Street, N. W., Washington, D. C., and the envelopes must bear the notation, "Essay Competition."